MECCANO MAGAZINE

APRIL
1936

PRICE
6d
VOL. XXI
No. 4

HORNBY ELECTRIC & CLOCKWORK TRAINS

The Most Fascinating Pastime in the World!

You have spent many happy hours watching real trains at work. Now start a railway of your own and enjoy the thrill of operating Engines, Coaches, Wagons, Signals and Points on actual railway principles. It's the most fascinating pastime in the world!

From the day of their introduction Hornby Trains have always represented the latest model railway practice. Designs are continually being improved and new items added so that the system is complete in practically every detail. There are Locomotives for all duties, driven by electric motors or by clockwork. There is Rolling Stock of all kinds including Pullman Cars, ordinary Coaches and Guard's Vans for passenger services, and numerous Wagons and Vans for freight working.

The Accessories are now better than ever before, while the Rails, Points and Crossings enable an endless variety of layouts to be constructed, both for Electrical and Clockwork Trains.

Hornby Train Sets are available at prices ranging from **15**/– to **75**/– for Electric models and **4**/**11** to **65**/– for Clockwork models.

A selection from the range of
HORNBY LOCOMOTIVES

ELECTRIC MODELS

EM120 (20-volt) or EM16 (6-volt) Locomotive (non-reversing) Price **8**/**6**.

EO20 (20-volt) Locomotive (reversing) Price **22**/–.

E120 (20-volt) or E16 (6-volt) Tank Locomotive (reversing) Price **24**/–.

E120 (20-volt) Special Tank Locomotive (automatic reversing) Price **30**/–.

E220 (20-volt) Special Tank Locomotive (automatic reversing) Price **32**/**6**.

E220 (20-volt) Special Locomotive (automatic reversing) Price **37**/**6**.

CLOCKWORK MODELS

M1/2 Locomotive (reversing) Price **4**/**6**.

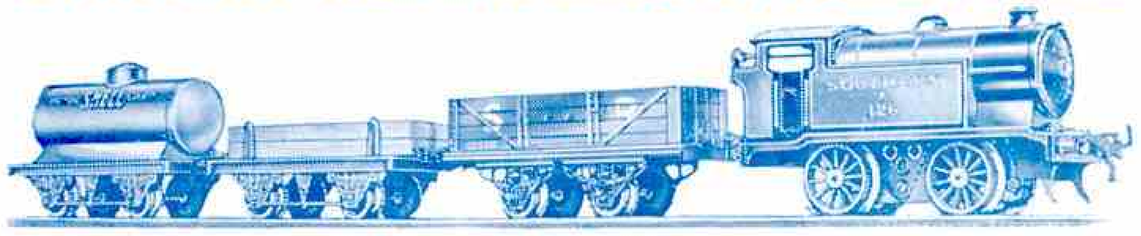
M3 Tank Locomotive (reversing) Price **7**/**6**.

No. O Locomotive (reversing) Price **10**/**6**.

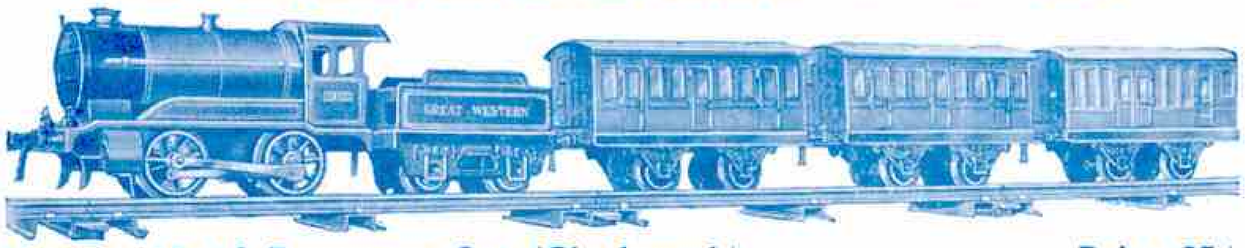
No. 2 Special Locomotive (reversing) Price **27**/**6**.

MECCANO LIMITED
Binns Road
LIVERPOOL 13

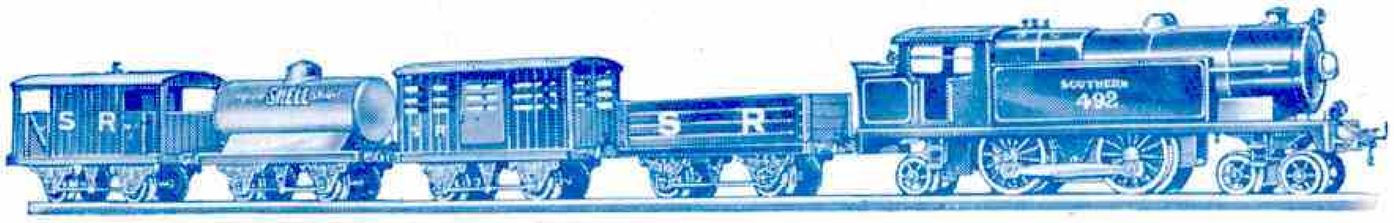
A SELECTION FROM THE RANGE OF HORNBY TRAINS



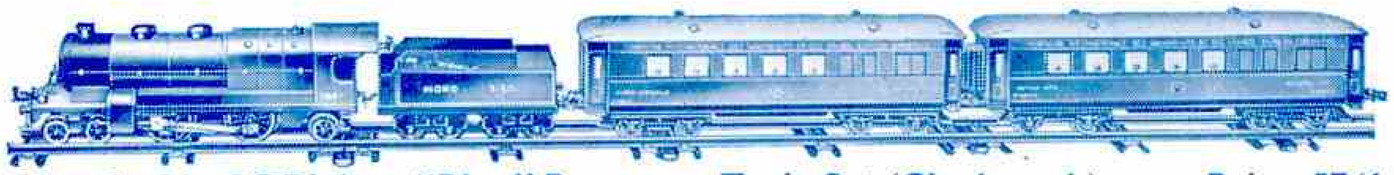
EM320 Tank Goods Set (20-Volt Electric) ... ...Price 24/–



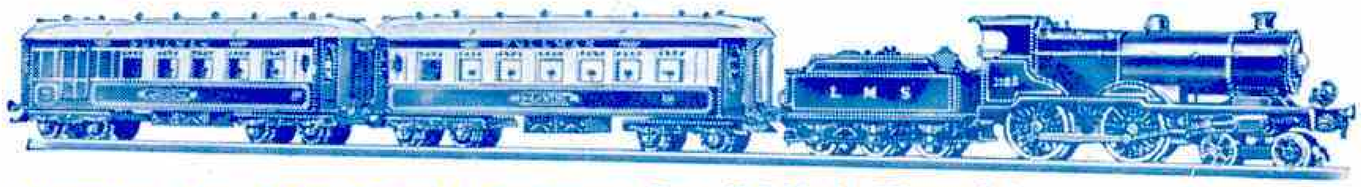
Hornby No. 1 Passenger Set (Clockwork) ... ... Price 25/–



Hornby E220 Mixed Goods Set (20-Volt Electric) ... ... Price 47/6

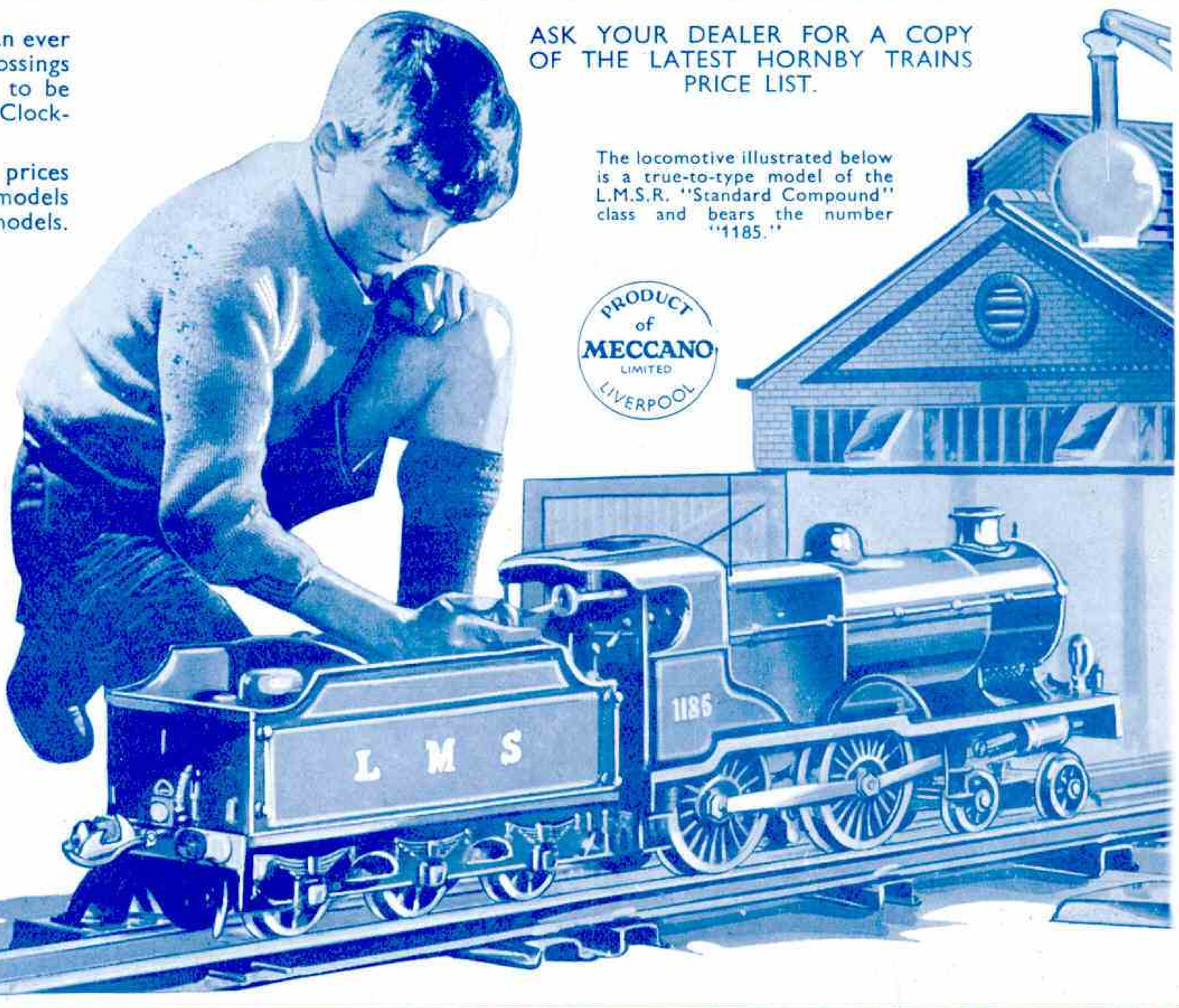


Hornby No. 3C Riviera "Blue" Passenger Train Set (Clockwork) ... Price 57/6



Hornby No. E220 Special Pullman Set (20-Volt Electric) ... ... Price 75/–

ASK YOUR DEALER FOR A COPY OF THE LATEST HORNBY TRAINS PRICE LIST.



EXTRA SPECIAL EDITION

REVIEW OF **HOME FLEET** AT HAMLEYS

Hamley's News

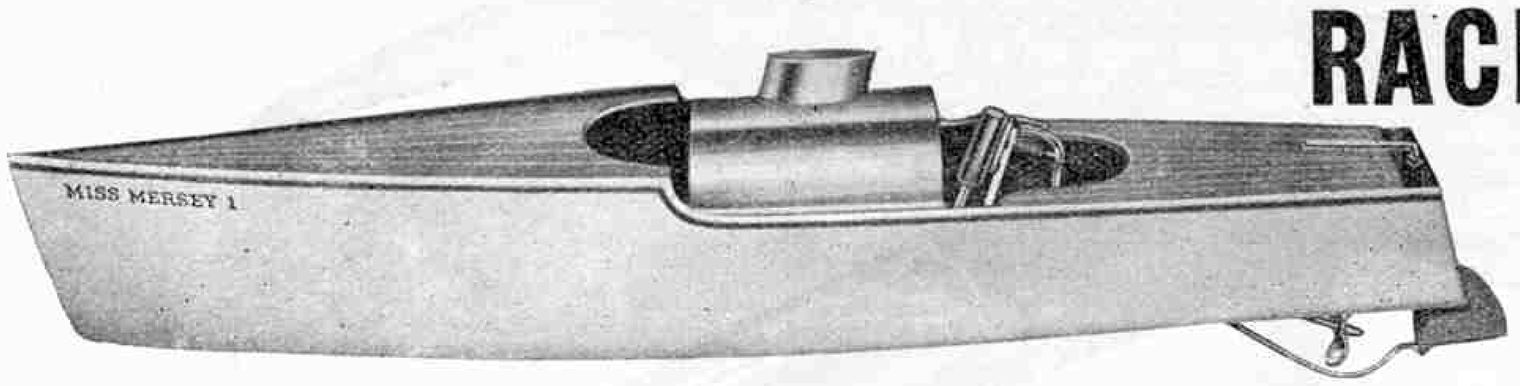
·HAMLEY · BROTHERS · LTD · ESTABLISHED · 1760 ·

200-202, REGENT ST., LONDON, W.I. OUR ONLY ADDRESS

No. 36 *April, 1936*

GREAT RE-ARMAMENT PROGRAMME

"MISS MERSEY I," STEAM DRIVEN RACER



Miss Mersey I, the last word in high power racing craft, has proved her long running ability and turn of speed. Sleek and lovely she looked speeding over the course, and spray flew in great white wings from her cruiser bow. Her pilot said, 'She handles like a thoroughbred, and has given no trouble at all.'

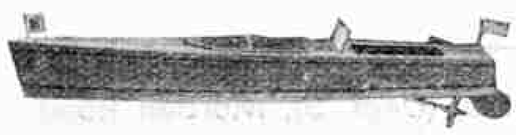
42/6 Hull enamelled white or red as required. Oscillating engine ¾" stroke, specially designed piston, solid brass turned flywheel, 4" boiler tested to 115 lbs. per square inch pressure, all brass propeller shaft, propeller and rudder, unspillable draught proof lamp.

'K' Class YACHTS GROWING IN POPULARITY

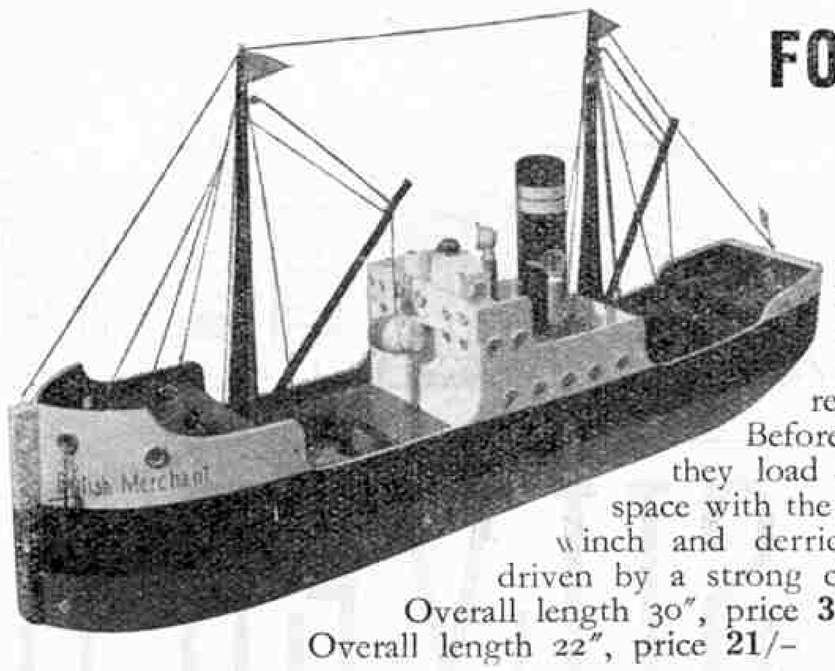
'K' Yachts are proving popular and successful at many regattas. They are beautifully rigged and finished. The patent lightweight hull is painted blue and white, has brass fittings and a polished mahogany deck. Rigging is of waterproof cord and the sails are best quality sail cloth. Fine sailing qualities are assured by perfect balance, cast lead keel and automatic steering.

'K' Yachts are available in the following models:
'Elizabeth,' length of hull 21", price **15/–**, post 6d.
'Margaret,' 26" hull, price **22/6**, post 9d.
"Rosemary," 32" hull, price **32/6**

NEW ECONOMY SPEED BOAT



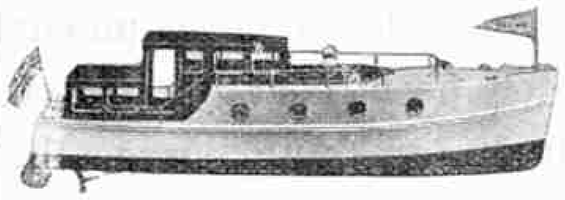
The Kellner Speed Boat is arousing admiration and envy at many a yacht club. With clean cut racing lines it stands out from the crowd, and a powerful clockwork motor sends it surging over the water with a fine turn of speed for 250 feet. The 25" hull is varnished mahogany. It is really good value at **10/6** Post 6d.



FOR HEAVY DUTY

Amateur mariners are having a lot of fun with this exact replica Cargo Boat. Before putting to sea they load the ample cargo space with the aid of a working winch and derrick. The boat is driven by a strong clockwork motor.
Overall length 30", price **37/6**
Overall length 22", price **21/–**

PLANS FOR THE CRUISING SEASON

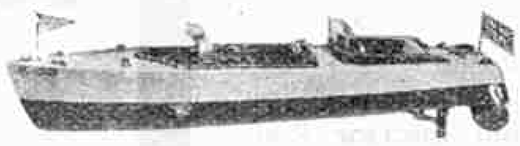


All the joys of river and coastal cruising are built into this seaworthy little Cabin Cruiser. Many proud owners are organising a 'round England' trip for the coming season. With the aid of a map it can be instructive as well as fun. The mahogany superstructure is detachable for fine weather, while electric navigation lights make night-going safe. An electric motor is fitted.

'Dido,' length of hull 20", is **32/6**
Battery included.
'Juno,' length of hull 23", is **39/6**
Battery included.
'Venus,' length of hull 28", is **49/6**
Batteries 2/6 extra.

SPEED BOAT OF PROVED PERFORMANCE

The Tri-ang Speed Boat is the perfect model speed boat, complete to the last detail. The long sleek green and white hull has a mahogany deck and is fitted with ventilators, fairleads and bollards. A hinged windscreen protects the cockpit. Powerful clockwork mechanism.



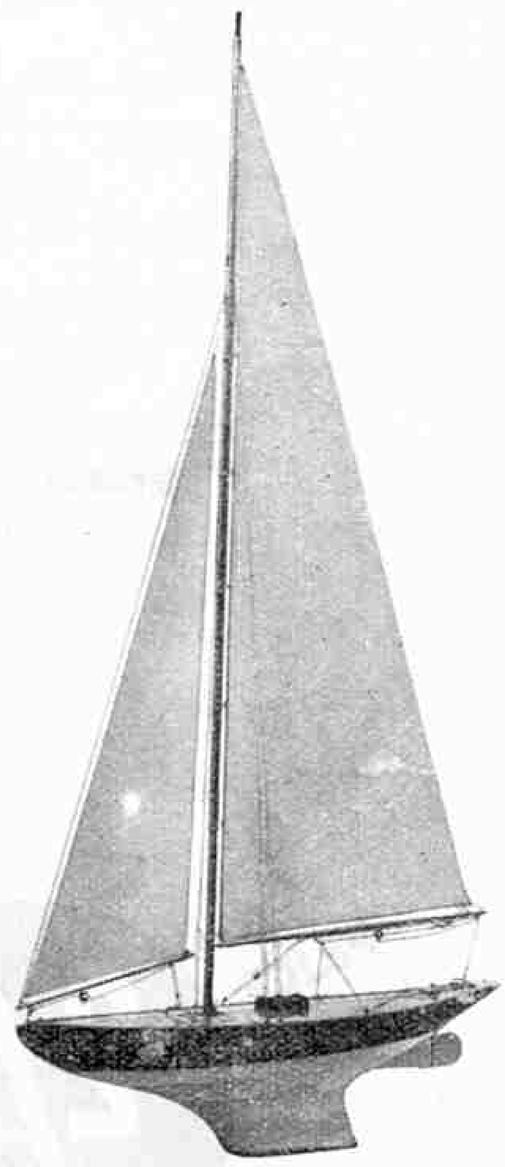
Length of hull 20", price **21/–**
Length of hull 23", price **29/6**
Electric models **25/–**, **35/–** and **37/6**

BRITISH YACHT

leads desperate race across

GREAT POND'

(From our Special Correspondent)

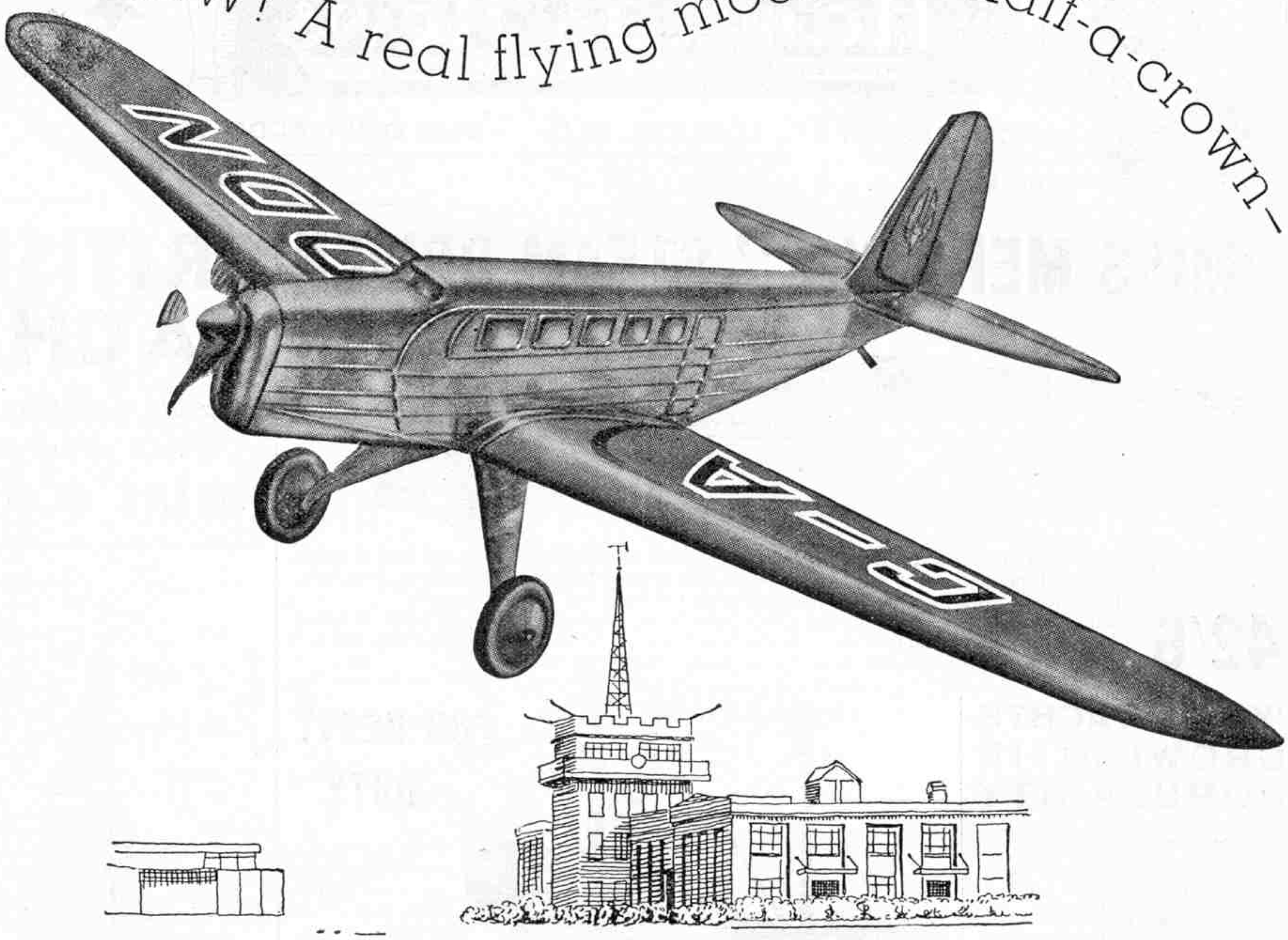


I saw 'White Spray' leading the fleet to-day. With a full spread of canvas she ran easily before a light breeze, but later as the wind stiffened she heeled over and out-distanced the field without effort. Her new-design rigging obviously enabled her to make the best of all weathers.

All sizes are fitted with ultra light-weight hollow rustless metal masts, all sails are union silk, fittings are nickel plated on brass. Varnished decks, mahogany rails. Each yacht is tested and guaranteed to have a very high performance.

Hull size	Price	Hull size	Price
18" ...	**30/–**	30" ...	**92/6**
22" ...	**45/–**	36"	**£6/12/6**
26" ...	**57/6**	42"	**£9/5/–**

NEW! A real flying model for half-a-crown—



SILVER ARROW

LOW WING MONOPLANE SINGLE ENGINE AIR LINER

PRICE 2/6 EACH

For the first time, air-minded men can buy a real flying model for half-a-crown: true to type, with a good performance, the Silver Arrow reproduces latest developments in Air Liners. Its price has deliberately been fixed at half-a-crown to enable a small fleet to be acquired, and to encourage the study of the theory and practice of flight.

SPECIFICATION

Aluminium Fuselage: Propeller and Nose Piece detach in a crash: Accurate pitched Propeller: Adjustable Controls: Transparent Windows: Wing Span 16½ ins.: Spare Motor and Insertor Rod: Double surface detachable Wings.

Designed and made by International Model Aircraft Ltd. Patented throughout the world. Sole concessionaires:—
Lines Bros. Ltd., Morden Road, London, S.W.19.

COUPON To Lines Bros. Ltd. (Dept. 5), Morden Road, London, S.W.19.

Please send me your "Frog" coloured leaflet with particulars of the "Frog" Flying Club and of how to obtain handsome enamelled Air Force pilot badges.

NAME.....

ADDRESS.....

Please write in block letters. 4/36

At Montlhery on Feb. 14 and 15, Capt. Eyston covered 2,279 miles in setting up the First Official 24 Hours World Record for heavy oil-engined cars. *(Subject to official confirmation.)*
The A.E.C. engine runs on fuel oil, instead of petrol, and is identical with those now being fitted in London Omnibuses.

C·C·WAKEFIELD & CO·LTD·WAKEFIELD HOUSE·CHEAPSIDE·LONDON·E·C·2

TOYS OF QUALITY MADE BY MECCANO LTD.

AEROPLANE CONSTRUCTOR OUTFITS

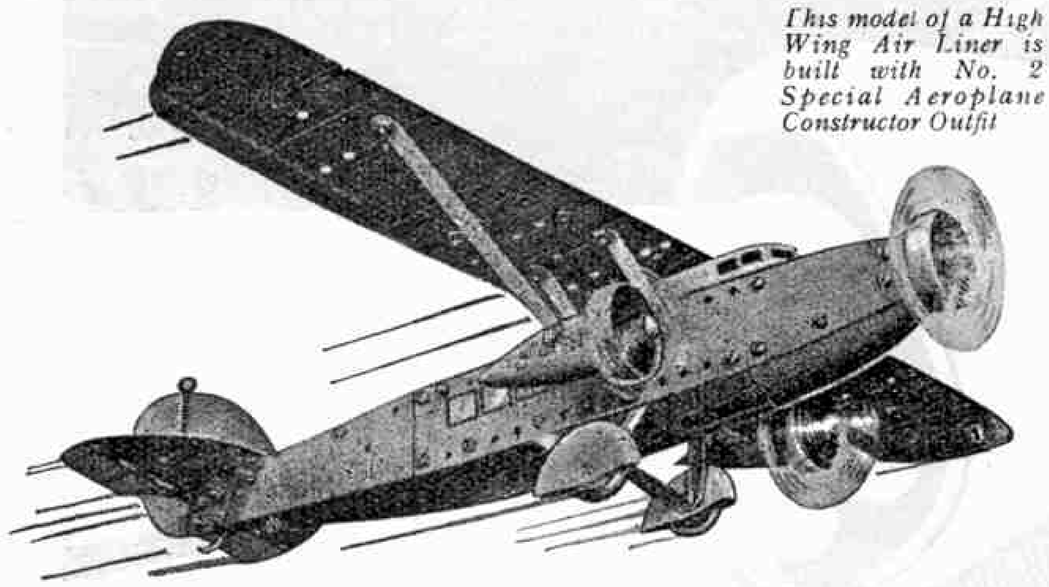
No. 2 Aeroplane Outfit. Price **12/6**

BOYS-BUILD YOUR OWN MODEL AIRCRAFT

Every boy should know how areoplanes are designed and constructed, and should be able to recognise at a glance the different types of machines in order to understand the purposes for which they have been developed.

These fine Constructor Outfits contain a range of aeroplane parts by means of which boys are able to design and build their own Aeroplanes quite easily.

The illustrated Manual of Instructions included in each Outfit shows how to build wonderful models of high and low wing Monoplanes, Biplanes, Seaplanes and many other interesting types.



This model of a High Wing Air Liner is built with No. 2 Special Aeroplane Constructor Outfit

Price List of Aeroplane Outfits

Standard Series.

No. OO Outfit	**3/3**	No. 1 Outfit	**7/6**
No. O Outfit	**4/6**	No. 2 Outfit	**12/6**

Special Series.

No. 1 Special Outfit	**12/6**
No. 2 Special Outfit	**21/-**

Note. The parts in the No. OO and No. O Outfits are not intended for use with the larger Outfits.

AEROPLANE HANGARS

No. 01 AEROPLANE HANGAR will accommodate one model made with the No. OO or No. O Outfits. Length 11½ in. Depth 10¼ in. Height 4¼ in. Price **4/6**

No. 02 AEROPLANE HANGAR will accommodate two models made with the No. O or No. OO Outfits. Length 21½ in. Depth 11 in. Height 6¼ in. Price **5/11**

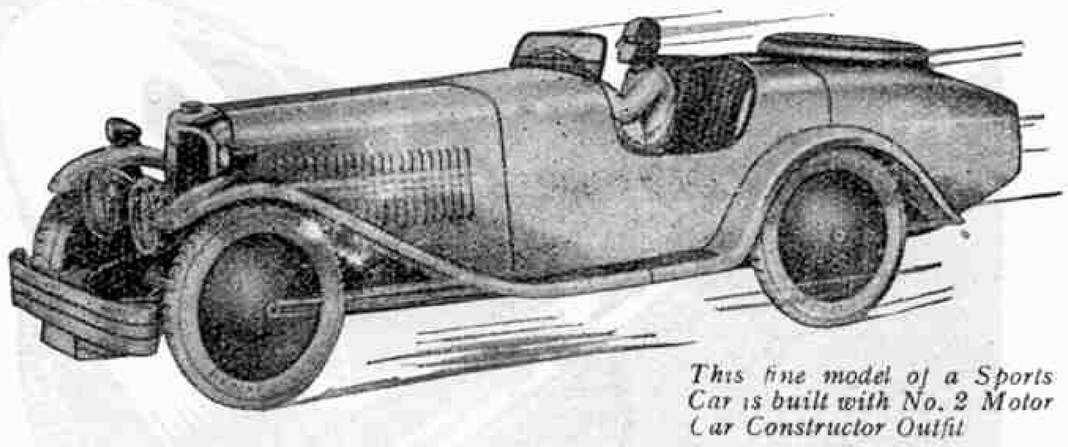
MOTOR CAR CONSTRUCTOR OUTFITS

YOU WILL BE KEEN TO HAVE ONE!

No. 1 Motor Car Outfit. Price **10/-**

Boys, as soon as you see these fine Motor Car Constructor Outfits you will be keen to have one. The models they build are superb. Sports four-seaters, coupés, speed cars and other perfect miniature reproductions, each one a beautiful model of its prototype. All the models are driven by a powerful Clockwork Motor (included in the Outfit), giving a long, speedy and realistic run on each winding.

The motor car parts are finished in rich enamel, nickel-plate and chromium, the complete Outfits being masterpieces of miniature automobile craftsmanship.



This fine model of a Sports Car is built with No. 2 Motor Car Constructor Outfit

No. 1 MOTOR CAR CONSTRUCTOR OUTFIT

The motor car models that can be built with this Outfit are splendidly realistic. Think of the fine fun you could have building these wonderful models, each one of which faithfully resembles its prototype.

No. 1 Outfit is supplied complete with powerful Clockwork Motor. Price **10/-**

No. 2 MOTOR CAR CONSTRUCTOR OUTFIT

Larger models of a superior type can be built with No. 2 Outfit. Their handsome and realistic appearance may be judged from the model illustrated above.

A powerful Clockwork Motor that gives a run of 150 feet on one winding is included in the Outfit. Price **20/-**

MOTOR CAR LIGHTING SET

With this Lighting Set the headlamps of Motor Car models built with the No. 2 Motor Car Outfit can be electrically lighted. Price **2/6**

MOTOR CAR GARAGE

This realistic Motor Car Garage provides accommodation for any Meccano model motor car or other cars of suitable size. Inside dimensions: Height 5 in. Length 13 in. Width 7⅞ in Price **5/6**

MECCANO LTD., BINNS ROAD, LIVERPOOL 13

FROG SCALE MODELS

demonstrate the principles of flight as applied to real aircraft

Not a toy—a pastime

TRADE MARK REGD.

FROG PUSS MOTH MONOPLANE

A handsome flying scale-model of the famous De Havilland light aeroplane in which many records have been broken.
Wing Span—18½″. Length—13½″. Complete with Patent High-Speed Winder Box, Spare Motors, Dual Insertor Rod, Motor Lubricant, Gear-box Oil and fully illustrated Instruction Manual. Flights of 600 ft. can be obtained under favourable conditions.

17/6

FROG INTERCEPTOR FIGHTER MK.IV

The original and now famous flying scale-model Interceptor Fighter.
Wing Span—11½″. Duralumin Fuselage. Complete with Patent High-Speed Winder Box, Spare Motors, Insertor Rod, Motor Lubricant, Gear-box Oil and fully illustrated Instruction Manual. With practice it will fly 300 ft.

Now only **5/-**

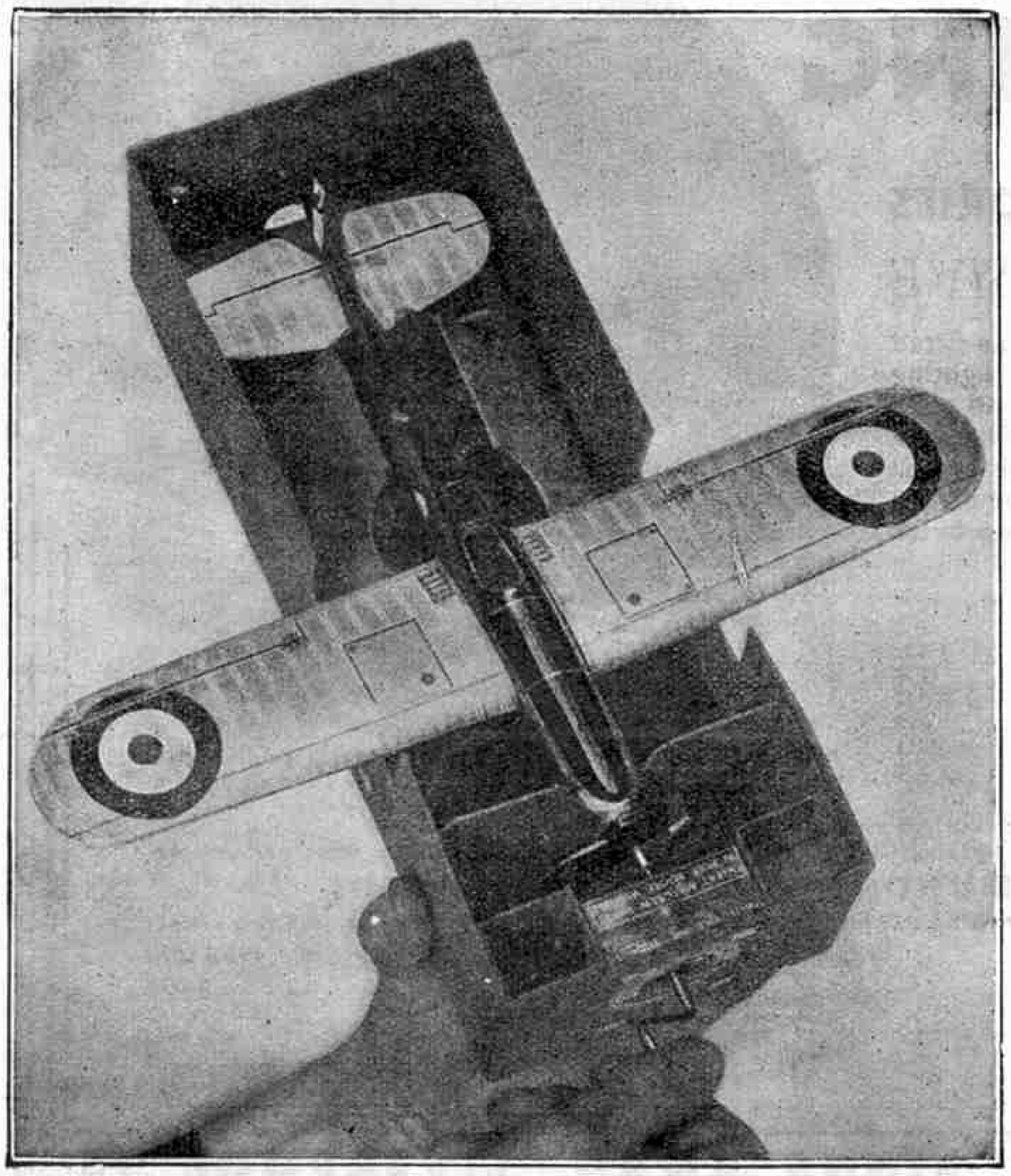


Photo of the FROG MK.IV being wound ready for flight.

FREE FLIGHT INSTRUCTION

Lines Bros. will give free flight instruction by appointment on the Frog Aerodrome at Merton. Telephone: Liberty 1041.

Frog scale model aircraft. Designed and made by International Model Aircraft Ltd. Patented throughout the world Sole concessionaires:

LINES BROS. LTD., Tri-ang Works, Morden Rd., S.W.19

COUPON To Lines Bros. Ltd. (Dept. 5), Morden Road, London, S.W.19.

Please send me your "Frog" coloured leaflet with particulars of the "Frog" Flying Club and of how to obtain handsome enamelled Air Force pilot badges.

Name .....

Address .....

Please write in block letters. 4/36

New Hornby Automatic Circuit Breaker

A Device to Replace Fuses

This new automatic Circuit Breaker for Hornby Electric Railways does away with the necessity for the renewal of the fuse wire. If a short circuit occurs, the Circuit Breaker automatically disconnects the power supply from the track, and thus prevents the possibility of any damage to the Transformer or accumulator. When the cause of the trouble has been removed, the circuit is instantly restored by simply pressing a button on the top of the Circuit Breaker.

The Circuit Breaker is simple to connect and use, and does not require adjustment of any kind. It is suitable for both 20-volt and 6-volt trains. Full instructions are packed with each one.

See illustrated article on page 237.

Price **3/6**

MECCANO LTD., BINNS ROAD
LIVERPOOL 13

ELECTRIC LIGHTING SYSTEM FOR HORNBY ACCESSORIES

BRILLIANT, SAFE AND INEXPENSIVE

The following is a comp'ete list of the Hornby Accessories available fitted for electric lighting. These accessories are specially designed for lighting from the 3½-volt circuit of a Meccano T20A or T6A Transformer, and with each of these Transformers are packed for the purpose a pair of Plugs, an Earthing Clip and a coil of Wire. together with full instructions. The Accessories can also be lighted from an accumulator. Each Accessory is accompanied by an Earthing Clip and a Leaflet giving full instructions for use. Lamp bulbs are not provided with the Accessories.

No. E1E Engine Shed	Price 15/6	No. 2E Signal Gantry	Price 12/9
No. E2E Engine Shed	„ 23/-	No. E1E Level Crossing	„ 5/3
No. 2E Station	„ 9/3	No. E2E Level Crossing	„ 9/-
Island Platform E	„ 6/3	No. 1E Buffer Stops	„ 1/6
No. 2E Goods Platform	„ 11/6	No. 2E Buffer Stops	„ 6/-
No. 2E Signal Cabin	„ 4/3	No. 2E Water Tank	„ 6/6
No. 2E Signal	„ 2/9	No. 1E Lamp Standard	„ 2/11
No. 2E Double Arm Signal ...	„ 3/11	No. 2E Lamp Standard	„ 3/3
No. 2E Junction Signal	„ 6/-		

This illustration of a scene on a Hornby layout, shows the striking effects obtainable with the Hornby Electric Lighting System

The following items used In connection with the latest system of Accessories lighting are available:
Plugs for Sockets of Transformers T20A and T6A. Price per pair, 6d. Earthing Clips, each 3d Connecting Wire. Price per coil, 4d

ACCESSORIES FOR LIGHTING WITH DISTRIBUTION BOX AND FLEXIBLE LEADS

The old type Accessories fitted for lighting by means of a Distribution Box and Flexible Leads with plugs and sockets are still available at the following prices:

No. E1E Engine Shed	Price 18/6	No. 2E Double Arm Signal	Price 6/6
No. E2E Engine Shed	„ 26/-	No. 2E Junction Signal	„ 9/-
No. 2E Station	„ 11/6	No. 2E Signal Gantry	„ 18/-
Island Platform E	„ 9/-	No. E1E Level Crossing	„ 7/-
No. 2E Goods Platform	„ 15/-	No. E2E Level Crossing	„ 11/-
No. 2E Signal Cabin	„ 5/6	No 1E Buffer Stops	„ 2/-
No. 2E Signal	„ 4/3	No. 2E Buffer Stops	„ 7/-

No. 2E Water Tank	Price 10/-
No. 1E Lamp Standard	„ 3/6
No. 2E Lamp Standard	„ 4/3
Flexible Leads, 9", 18", and 36". Prices 1/4, 1/5 and 1/6 respectively.	
Distribution Box	Price 2/6

Manufactured by MECCANO LTD., BINNS ROAD, LIVERPOOL 13

Bluemel's

FAMOUS FOR QUALITY

IF your bicycle costs in the region of five pounds, you are entitled to expect Bluemel's mudguards, pump and reflector. *When price is not the only consideration, manufacturers and clubmen alike fit Bluemel's.*

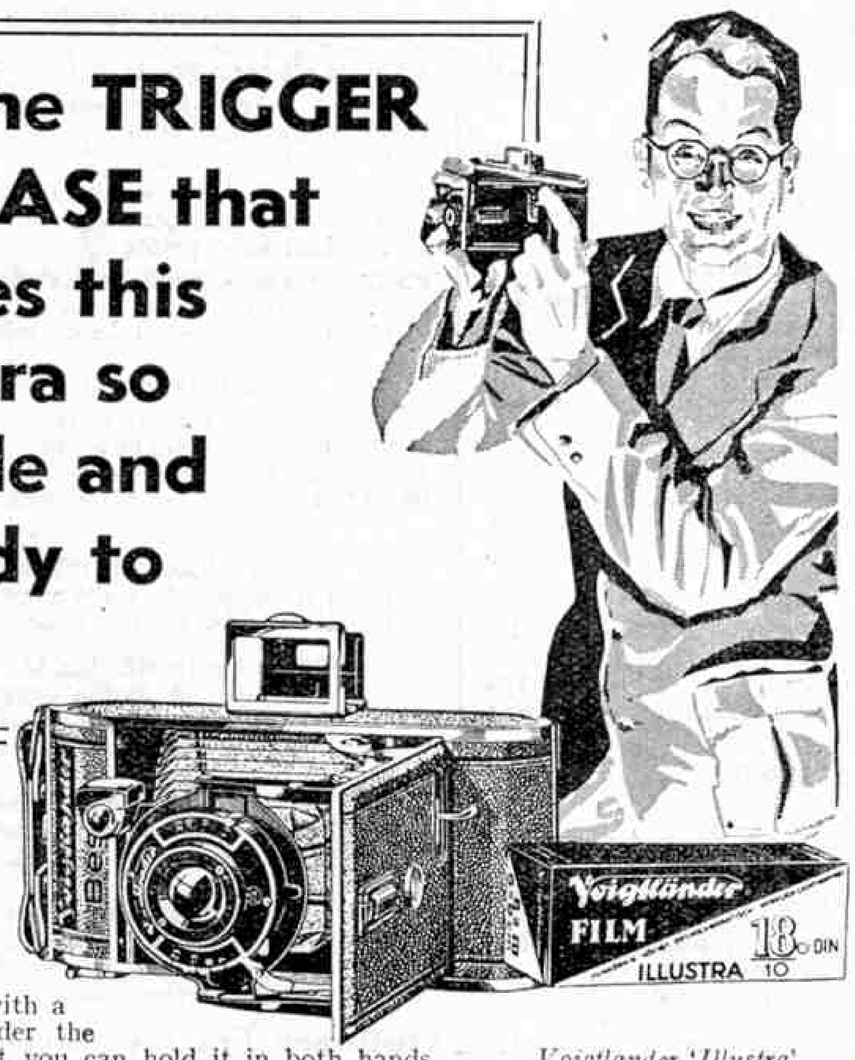
HERE IS THE NEW MUD-GUARD WITH BUILT IN WHITE PATCH

(Prov. pat. 27917-35)

It is available in "Noweight" (**7/3** per pair). "Featherweight" (**5/2**) and "Lightweight" (**6/10**). Without white patch 6d. less. Fork Clips extra if required. 15" Featherweight pump, **2/–**; others from **1/6**. No. 10 Prismatic reflector with white body as illustrated, **1/4**. Black body **1/3**.

Bluemel Bros. Ltd., Dept. 27, Wolston, Nr. Coventry

It's the TRIGGER RELEASE that makes this camera so simple and speedy to use!



THE Voigtlander Bessa is the only camera with a trigger release under the baseboard—so that you can hold it in both hands at eye-level and take your snap **as** you see it and **when** you see it, with no risk of shakiness. It is the simplest and speediest camera to use—and one of the most economical, for it gives 8 full size or 16 half-size pictures on a standard 2¼ in. × 3¼ in. spool. Made by a firm with 180 years reputation, the Voigtlander Bessa is remarkable value at its price.

Voigtlander 'Illustra' film for speed and sparkling negatives. Ask your dealer for it.

With genuine Voigtlander F/7.7 Anastigmat lens in speeded shutter **52/6**

Voigtländer BESSA

Your dealer will be pleased to show you the Voigtlander Bessa or write for the Voigtlander Catalogue to

SCHERING LTD. (Voigtlander Dept. 9), 188/192, High Holborn, W.C.1.

Toiling?

NOT THESE LEGS!

Why push against a worn-out chain? Don't waste time and leg-power. Get your birthday present NOW—a new Renold chain—and with it years of silky-smooth easy running.

3'6 each—and well worth it!

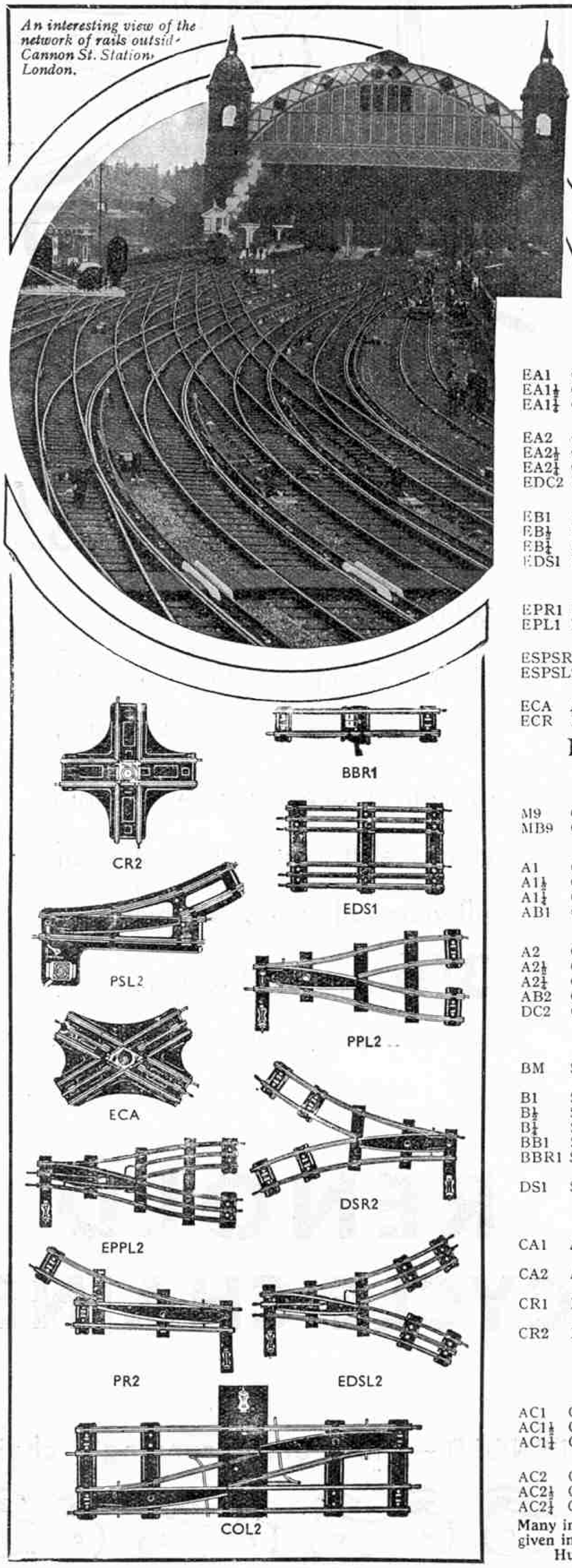
FREE—Write for "Easy Running for Cyclists" booklet

RENOLD CYCLE CHAINS

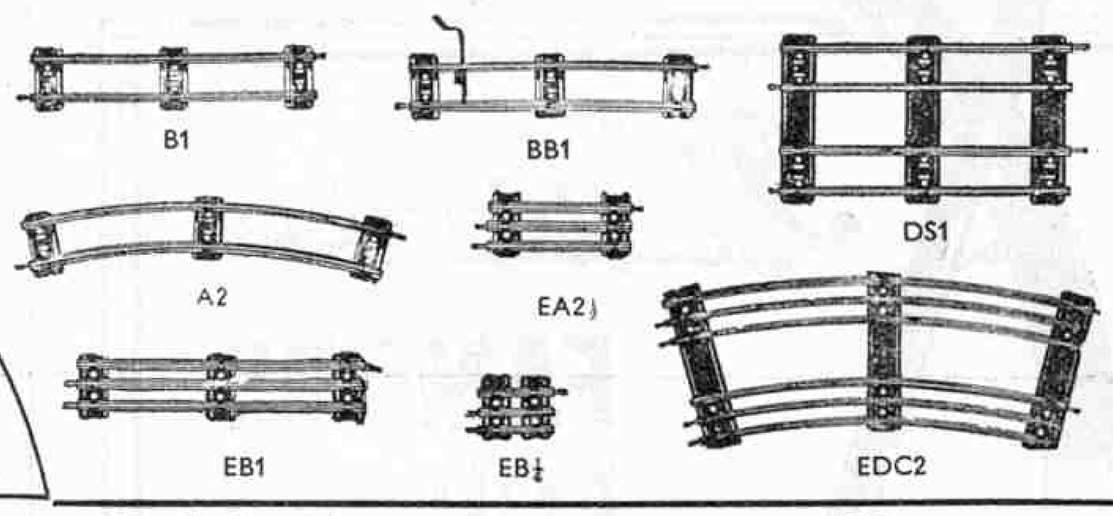
RENOLD—the "easy running" chain

THE RENOLD & COVENTRY CHAIN CO LTD., Manchester, England

Hornby Rails, Points and Crossings



An interesting view of the network of rails outside Cannon St. Station, London.



Rails for Electric Trains, Gauge 0, 1¼"

CURVED RAILS

1-ft. Radius

EA1	Curved Rails ...	... per doz.	5/-
EA½	Curved half rails ...	„	4/6
EA¼	Curved quarter rails ...	„	4/-

2-ft. Radius

EA2	Curved rails ...	... per doz.	5/-
EA2½	Curved half rails ...	„	4/6
EA2¼	Curved quarter rails ...	„	4/-
EDC2	Curved rails, double track, ½ doz.		9/-

STRAIGHT RAILS

EB1	Straight rails ...	... per doz.	5/-
EB½	Straight half rails ...	„	4/6
EB¼	Straight quarter rails ...	„	4/-
EDS1	Straight rails, double track, ½ doz.		8/6

POINTS

For 1-ft. Radius Curves

EPR1	Right-hand points	... per pair	5/9
EPL1	Left-hand points		

For 2-ft. Radius Curves

ESPSR2	Right-hand points	per pair	7/6
ESPSL2	Left-hand points		

CROSSINGS

ECA	Acute-angle crossings ...	each	2/9
ECR	Right-angle crossings ...	„	2/9

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

EDSR1	Double symmetrical points, right-hand	... per pair	6/-
EDSL1	Double symmetrical points, left-hand		

For 2-ft. Radius Curves

EDSR2	Double symmetrical points, right-hand	... per pair	7/-
EDSL2	Double symmetrical points, left-hand		

PARALLEL POINTS

EPPR2	Parallel points, right-hand	per pair	
EPPL2	Parallel points, left-hand		7/-

CROSSOVER POINTS

ECOR2	Crossover points, right-hand	per pair	
ECOL2	Crossover points, left-hand		24/-

EMC20	Switch rail (20-volt) ...	each	1/3
EMC6	Switch rail (6-volt) ...	„	1/3
TCP20	Terminal Connecting Plates (20-volt)	„	1/3
TCP6	Terminal Connecting Plates (6-volt)	„	1/3

Rails for Clockwork and Steam Trains, Gauge 0, 1¼"

CURVED RAILS

9-in. Radius (for MO Trains)

M9	Curved rails ...	... per doz.	2/6
MB9	Curved brake rails ...	each	3d.

1-ft. Radius

A1	Curved rails ...	... per doz.	3/6
A1½	Curved half rails ...	„	3/-
A1¼	Curved quarter rails ...	„	2/6
AB1	Curved brake rails ...	each	4d.

2-ft. Radius

A2	Curved rails ...	... per doz.	3/6
A2½	Curved half-rails ...	„	3/-
A2¼	Curved quarter rails ...	„	2/6
AB2	Curved brake rails ...	each	5d.
DC2	Curved rails, double track, ½ doz.		6/-

STRAIGHT RAILS

BM	Straight rails (for MO Trains),	per doz.	2/6
B1	Straight rails	„	3/6
B½	Straight half rails ...	„	3/-
B¼	Straight quarter rails ...	„	2/6
BB1	Straight brake rails ...	each	4d.
BBR1	Straight brake and reverse rails,	each	1/6
DS1	Straight rails, double track, ½ doz.		5/3

CROSSINGS

CA1	Acute-angle crossings (for 1-ft. radius tracks)	each	1/9
CA2	Acute-angle crossings (for 2-ft. radius tracks)	„	1/6
CR1	Right-angle crossings (for 1-ft. radius tracks)	„	1/9
CR2	Right-angle crossings (for 2-ft. radius tracks)	„	1/6

POINTS

9-in. Radius (for MO Trains)

MR9	Right-hand points	... per pair	3/-
ML9	Left-hand points		

For 1-ft. Radius Curves

PR1	Right-hand points	... per pair	3/-
PL1	Left-hand points		

For 2-ft. Radius Curves

PR2	Right-hand points	... per pair	3/-
PL2	Left-hand points		
PSR2	Points on solid base, right-hand	per pair	8/6
PSL2	Points on solid base, left-hand ... ... (Fitted for Hornby Control)		

SPSR2 Points on solid base, right-hand } per pair 5/-
SPSL2 Points on solid base, left-hand }

These points are similar to Points PSR2 and PSL2 but they are not fitted with ground disc or for Hornby Control.

PARALLEL POINTS

PPR2	Parallel points, right-hand	per pair	3/6
PPL2	Parallel points, left-hand		

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

DSR1 Double symmetrical points, right-hand
DSL1 Double symmetrical points, left-hand
per pair 3/6

For 2-ft. Radius Curves

DSR2 Double symmetrical points, right-hand
DSL2 Double symmetrical points, left-hand
per pair 3/6

CROSSOVER POINTS

COR2	Crossover points, right-hand	per pair	
COL2	Crossover points, left-hand		12/-
RCP	Rail Connecting Plates ...	½ doz.	2d.

Centre Rails for Converting Ordinary Track to Electrical

1-ft. Radius

AC1	Curved centre rails ...	... per doz.	1/-
AC1½	Curved centre half rails	„	9d.
AC1¼	Curved centre quarter rails	„	6d.

2-ft. Radius

AC2	Curved centre rails ...	... per doz.	1/-
AC2½	Curved centre half rails	„	9d.
AC2¼	Curved centre quarter rails	„	6d.

BC1	Straight centre rails ...	... per doz.	1/-
BC½	Straight centre half rails ...	„	9d.
BC¼	Straight centre quarter rails	„	6d.

ICR	Insulators for insulating centre rails ...	... per doz.	3d.
CCR	Clips for fixing centre rails	„	6d.

Many interesting illustrations and much useful information regarding Hornby Railway layouts are given in the booklets entitled "How to plan your Hornby Railway," and "Hornby Layouts—One Hundred Suggestions." Each of these booklets is obtainable from your dealer, price 3d.

Manufactured by MECCANO LTD., BINNS ROAD, LIVERPOOL 13

HORNBY SERIES

HORNBY ROLLING STOCK

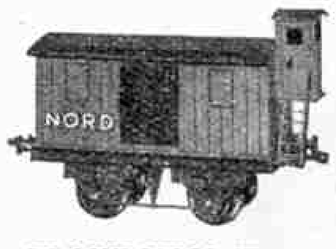
GAUGE O

Now is the time to add to your Hornby Railway. Every boy knows that a real railway system is constantly expanding and developing. New rolling stock and new equipment are added; new tracks are laid; new stations, signal cabins and goods sheds are built; new tunnels and viaducts are constructed—every effort is made to cater for modern requirements. Your Hornby railway, too, can be run in the same progressive manner. One by one you can add Coaches, Trucks, Wagons and Vans of the latest types; and Stations, Signals, Bridges, Turntables and Engine Sheds that will gradually convert your present Hornby railway into a really fine model railway system.

Ask your dealer to show you the full range of Hornby Rolling Stock and Accessories.

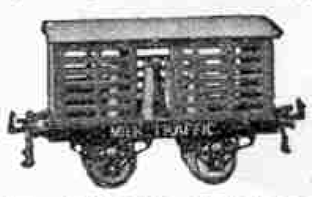
OIL TANK WAGON "MOBILOIL"
Finished in battleship grey. Price **2/-**

ROTARY TIPPING WAGON No. O
Price **1/6**

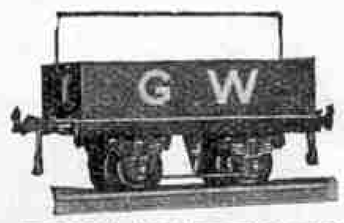


BRAKE VAN (French Type)
Lettered "Nord." Beautifully finished in colours. Opening doors. Price **4/-**

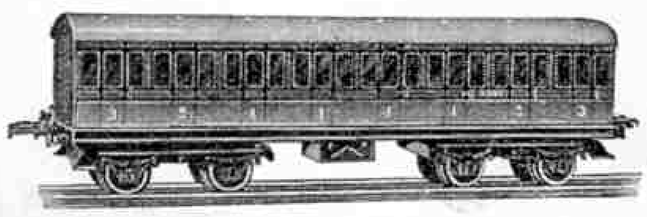
No. 1 BANANA VAN "FYFFES"
An attractive model, finished in yellow and red. Price **2/9**



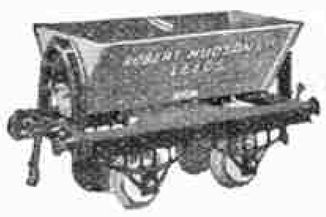
No. 1 MILK TRAFFIC VAN
Fitted with sliding doors. Complete with milk cans. Price **2/11**



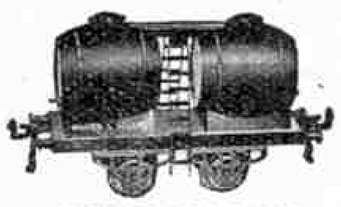
***OPEN WAGON "B"**
Similar to Hornby Wagon No. 1 but fitted with centre tarpaulin supporting rail. Price **2/-**



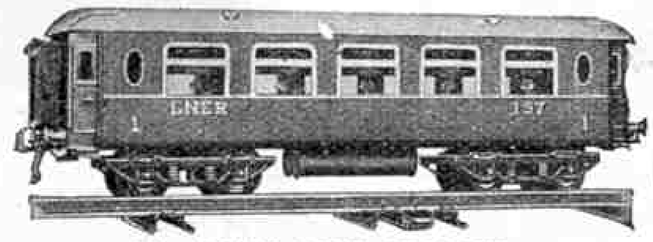
***No. 2 PASSENGER COACH**
Suitable for 2 ft. radius rails only. First-third, or Brake-third. Price **7/6**



No. 1 SIDE TIPPING WAGON
Excellent design and finish. Lettered "Robert Hudson Ltd." Price **2/-**

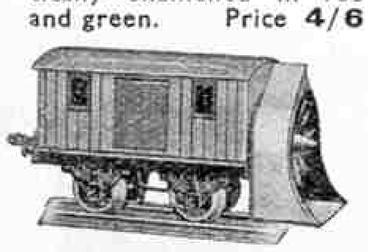


WINE WAGON DOUBLE BARREL
An attractive model artistically enamelled in red and green. Price **4/6**

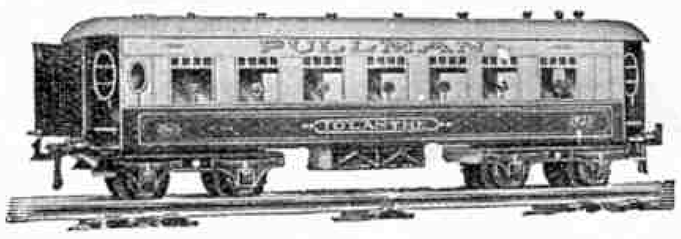


No. 2 SALOON COACH
Realistic in design and beautifully finished. Two types are available: L.N.E.R. (as illustrated) enamelled brown, and L.M.S. enamelled maroon. Suitable for 2-ft. radius rails only. Price **9/6**

No. 1 TIMBER WAGON
Beautifully enamelled in yellow and red. Price **1/6**

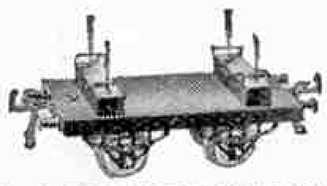


SNOW PLOUGH
With revolving plough. Price **3/9**



No. 2 SPECIAL PULLMAN COACH
As supplied with No. 2 Special and No. 3 Pullman Train Sets. This splendid coach is perfect in detail and finish. Suitable for 2-ft. radius rails only. Price **13/-**

***GUNPOWDER VAN**
Finished in red. With opening doors. Price **2/9**



No. 1 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Price **1/6**

TROLLEY WAGON
Finished in brown and blue. Suitable for 2-ft. radius rails only. Price **3/9**

BITUMEN TANK WAGON "COLAS"
Finished in blue. Price **3/6**

No. O MITROPA COACH
Finished in red with white roof. Lettered "Mitropa," with either "Speisewagen" or "Schlafwagen" in gold. Price **1/6**

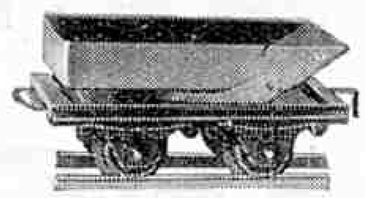
No. 2 TIMBER WAGON
Beautifully enamelled in green and red. Suitable for 2-ft. radius rails only. Price **2/6**

No. O MILK TRAFFIC VAN
An attractive model Available lettered G.W. only. Price **1/9**

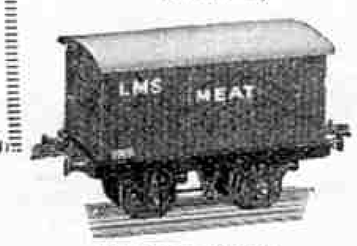
COAL WAGON
This is similar to Hornby Wagon No. 1. It is fitted with embossed representation of coal. Price **2/3**

No. 2 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Suitable for 2-ft. radius rails only. Price **2/11**

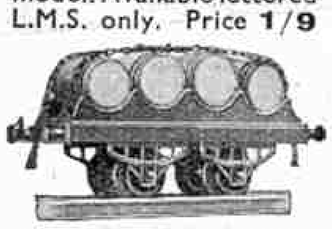
In L.M.S., L.N.E.R., G.W. or S.R. lettering.



MO ROTARY TIPPING WAGON
Container revolves and tips at any angle. Price **1/-**

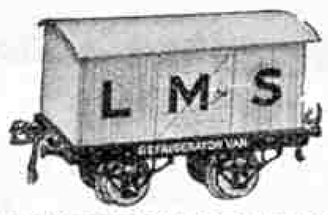


MEAT VAN
This is a very realistic model. Available lettered L.M.S. only. Price **1/9**



BARREL WAGON
This is another interesting model of a type of wagon used in France and other European countries. Price **2/6**

COVERED WAGON (French Type)
This wagon is fitted with frame and sheet. Lettered "Nord." Price **2/6**



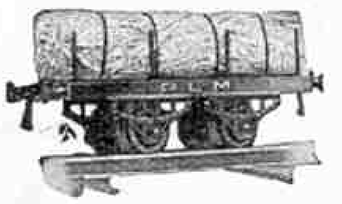
***REFRIGERATOR VAN**
Beautifully enamelled. Fitted with opening doors. Price **2/9**

No. 1 CRANE TRUCK
Finished in brown and blue. Price **2/11**

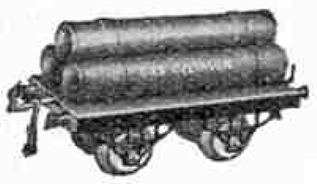
***No. 1 CATTLE TRUCK**
Fitted with sliding doors. Very realistic design. Price **2/9**

FISH VAN
This is a distinctive model. Available lettered N.E. only. Price **1/9**

OIL TANK WAGON "CASTROL"
An attractive model. Enamelled green with lettering in red. Price **2/-**

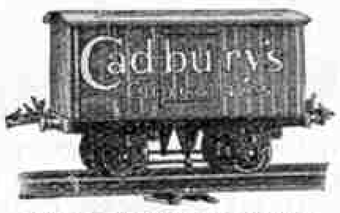


FIBRE WAGON
This is an interesting model of a type of wagon used in France and other European countries. Price **1/3**

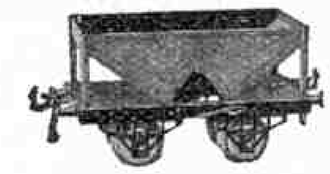


GAS CYLINDER WAGON
Finished in red, lettered gold. Price **1/11**

No. 1 ROTARY TIPPING WAGON
Finished in orange. Price **2/6**



CHOCOLATE VAN "CADBURY'S"
This van is beautifully enamelled in blue with white roof. Price **2/9**



***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price **3/6**

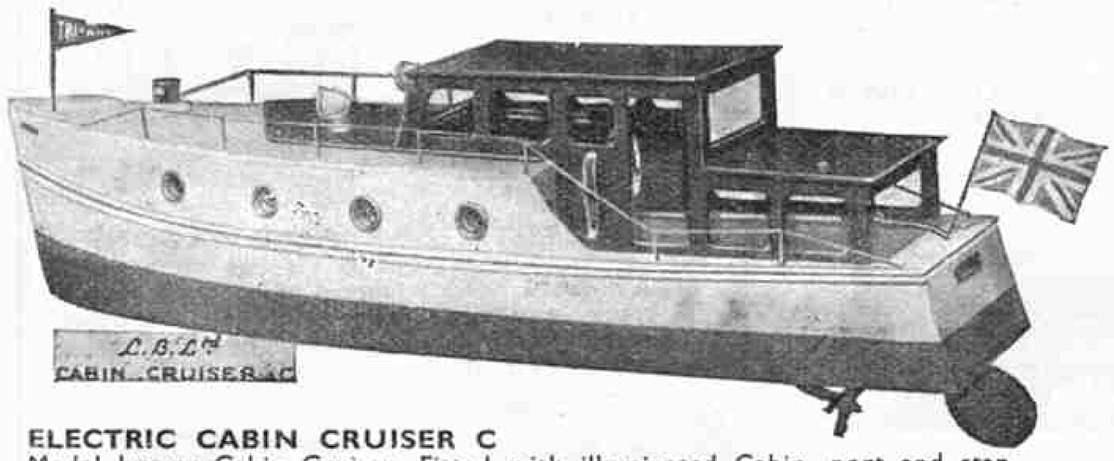
MILK TANK WAGON "UNITED DAIRIES"
A very realistic model, finished in blue and white. Price **4/6**

CEMENT WAGON
The door at the top opens. Finished in bright red Price **2/6**

Manufactured by **MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13**

YACHTS & SPEED BOATS

TRI-ANG CABIN CRUISERS & COASTAL STEAMERS

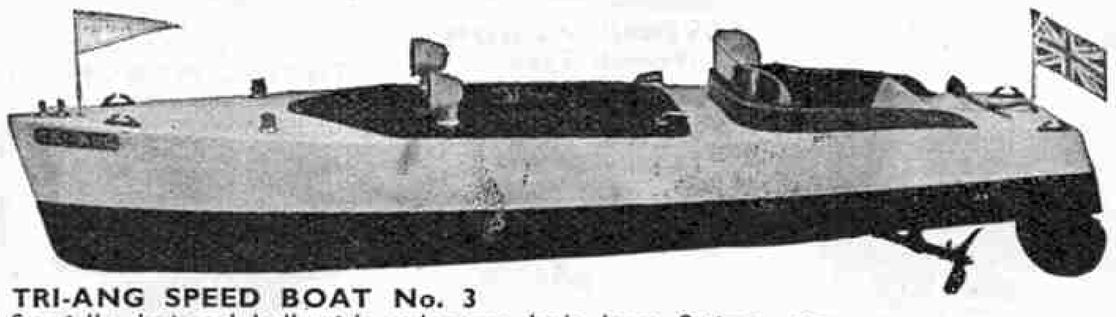


ELECTRIC CABIN CRUISER C
Model luxury Cabin Cruiser. Fitted with illuminated Cabin, port and starboard lights, detachable mahogany superstructure. Separate switches for lights and motor. Complete with bow pennant, stern flag and dummy ventilators. Length of hull 28 in. **49/6**

OTHER MODELS **32/6, 39/6**

K SPEED BOAT No. 1
Fitted with powerful mechanism, windscreen, dummy ventilators, control lever and adjustable rudder. Hull 16 in. overall. **6/6**

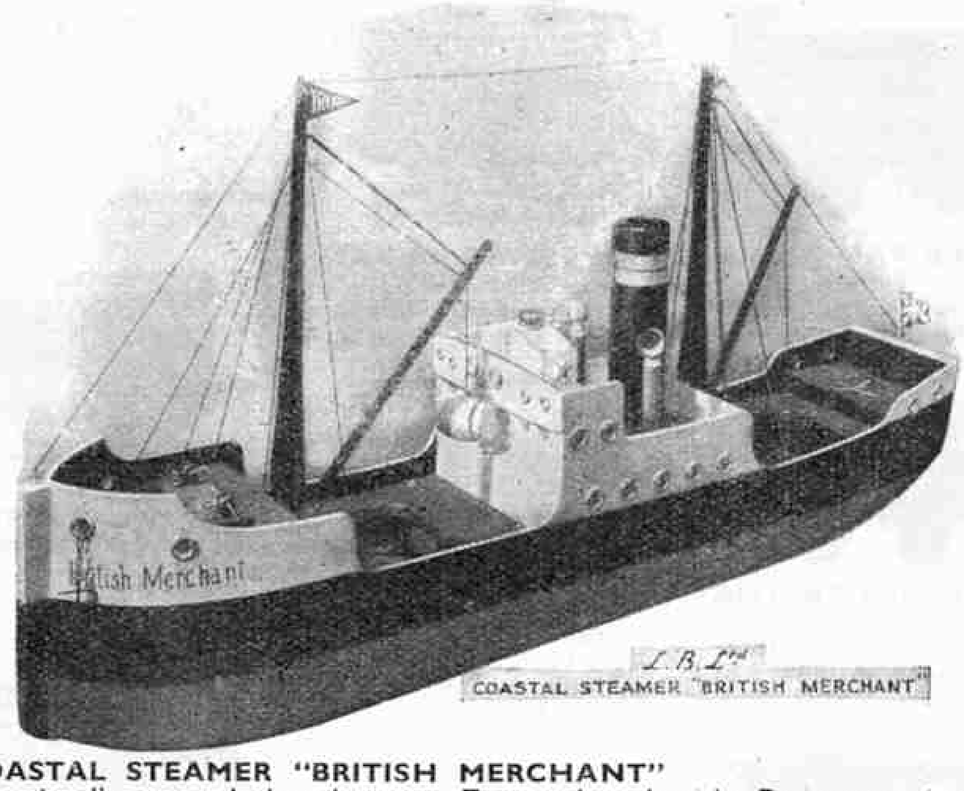
OTHER MODELS **1/–, 2/6** and **4/6**



TRI-ANG SPEED BOAT No. 3
Specially designed hull with mahogany deck, brass fittings, ventilators and detachable motor cover. Very powerful clockwork mechanism. Complete with bow pennant and stern flag. Hull 20½ in. overall. **21/-**

ALSO SUPPLIED WITH ELECTRIC MOTOR **25/–**
OTHER MODELS **10/6, 29/6, 35/–, 39/6**

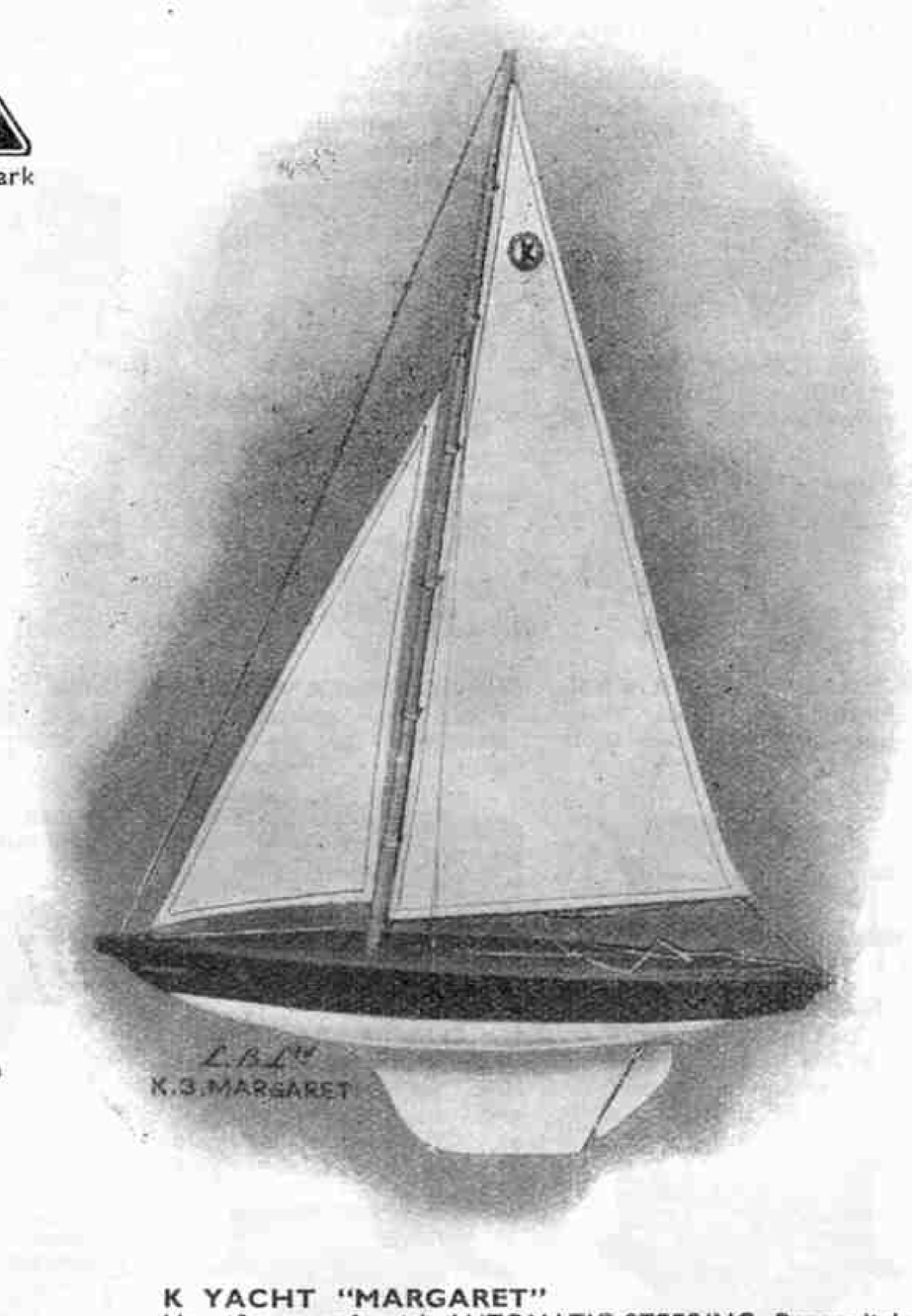
OBTAINABLE AT ALL GOOD TOY SHOPS AND STORES



COASTAL STEAMER "BRITISH MERCHANT"
Exceptionally strong clockwork motor. Two working derricks. Dummy ventilating shafts, portholes and navigating lights. Anchor and chain. Two holds with dummy cargo. Hull finished in red and black with white superstructure. Overall length 30 in. **29/6**

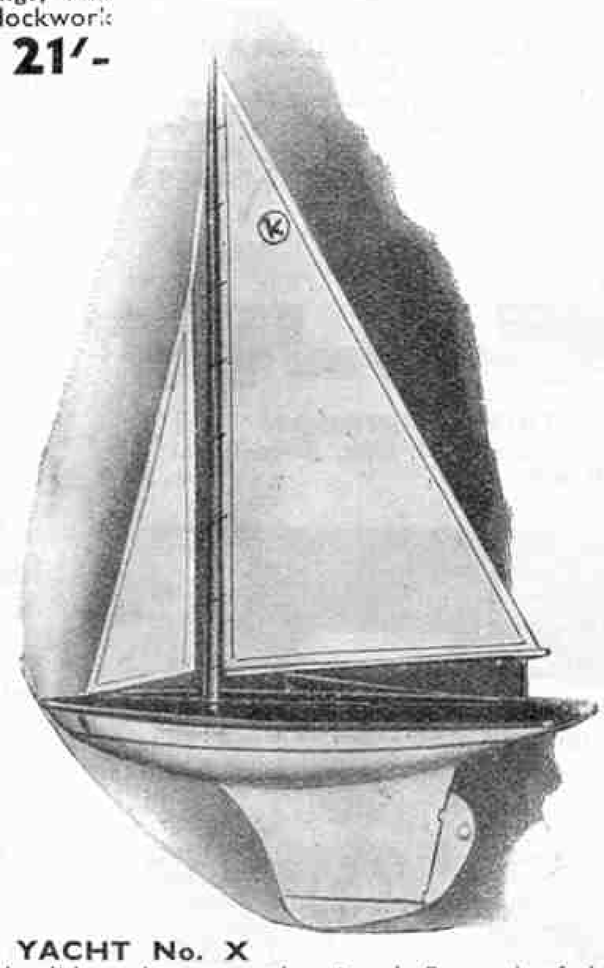
OTHER MODELS **10/6, 17/6**

L. BROS. LTD. LONDON BB 05 ENGLAND
Reg. Trade Mark



K YACHT No. 00
All steel hull, will not capsize. Fully adjustable sails. The decks are realistically embossed with dummy hatches, etc. Nicely finished in colour. Length of hull 12 in. **1/-**

OTHER MODELS **2/6, 3/6**



K YACHT No. X
Splendid yacht correctly rigged Bermuda fashion. With best quality masts and selected boom. Metal keel with swinging rudder. Pressed hull nicely finished in white enamel. Mahogany deck. Length of hull 18½ in. **7/6**

LARGER MODEL **10/6**

K YACHT "MARGARET"
Magnificent craft with AUTOMATIC STEERING. Patent lightweight weather resisting hull. Solid mahogany polished deck. Mast and boom made from finest selected material, best quality sails, fully adjustable. Beautifully finished in Blue and White. Length of hull 26 in. **22/6**

OTHER MODELS **15/–, 32/6**

Made in England by

Lines Bros. Ltd., Tri-ang Works, Morden Rd., London, S.W.19

NEXT MONTH: "THE LIFE STORY OF A PENCIL." PUBLISHING DATE: 1st MAY

MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

Vol. XXI. No. 4
April, 1936

With the Editor

New "M.M." Features

Readers will be pleased to find that "*Road and Track*" again makes its appearance this month. This will be a regular feature throughout the summer, as in previous years, appearing alternately with "*Engineering News.*"

I also have in preparation pages dealing with ships and shipping. In these details will be given of the building and launching of new ships, together with news of events of interest in connection with the sea generally. Thus the pages will cover the shipping world in the same manner as "*Railway News*" deals with matters of railway interest, and I am sure that they will please all readers of the Magazine.

Another attraction that I hope to include in forthcoming issues of the Magazine takes the form of articles describing trips by aeroplane. These will describe actual journeys in machines in service on British air lines. They will be similar to the accounts of footplate trips, by "A Railway Engineer," and of sea trips, by Mr. O. S. Nock, that have appeared in recent issues, and are certain to prove equally popular.

Are Record Flights Worth While?

The record-breaking effort of Flight Lieutenant T. Rose ended too late to allow reference to be made to it in the "*Air News*" pages of this month's issue, but it is not too late to congratulate the famous airman on his wonderful flight to South Africa and back again. It is astonishing to reflect that he reached Capetown, more than 7,000 miles away by the route he followed, in less than four days, and completed the return trip in little more than six days, in spite of being detained for a time in Tripoli because he had unfortunately omitted to obtain the necessary permits.

This is the third time that Flt. Lt. Rose has attempted to create records for the flight to South Africa and back, and his persistence in the face of misfortune has been amply rewarded. Those of my readers who heard him speak in the wireless programme on the day of his arrival in England no doubt will remember his suggestion that the game of record-breaking was scarcely worth the candle. It is true that it is no longer necessary to make daring but risky flights in order to show what aeroplanes can do, but I have no doubt that the call to record-breaking efforts, whatever the dangers involved, will continue to be irresistible.

The kind of flight to which I do very strongly object is that made by certain individuals whose chief desire is to achieve easy notoriety. These do little to make people air minded.

An Impression of the "*Queen Mary*"

A regular reader in Glasgow recently wrote to tell me about a visit he had been fortunate to make to the "*Queen Mary*" just before she left Clydebank for her trials. I am sure that readers are as interested in the great liner as I am, and give the following extracts from his letter.

"It was late in the evening when I reached the yard of John Brown and Co. Ltd., and I shall never forget the wonderful sight that presented itself when I turned the corner of a large building and suddenly saw the giant vessel gleaming in the glare of great floodlighting lamps.

"In the short time at my disposal I saw only a few of the things of interest in the '*Queen Mary*,' but I saw sufficient to convince me that she is the most marvellous vessel afloat. I realised for the first time her enormous size when I looked along the lengthy promenade deck, the circuit of which measures a quarter of a mile; and my impression of her spaciousness was increased when I mounted the navigating bridge and looked around me. I stood in one of the bridge houses, projecting 12 ft. over the side of the vessel at what seemed to me a stupendous height above the water.

"I could have stayed for a long time in the great wheel-house, where I was fascinated by the compasses, engine room telegraphs and speaking tubes, and by the steering gear, which is in duplicate in order to provide for all emergencies. One of the chief wonders of the '*Queen Mary*' is a gyro pilot that automatically will keep the vessel on her course with far greater accuracy than is possible with the best of helmsmen. Ahead of me I could see the foremast, with the crow's nest half way up. This is reached by means of a ladder running up the interior of the foremast, and even in their elevated position in it the men on the lookout will be warm and comfortable, for it has a roof and is provided with a glass windscreen and electric heaters.

"When I went below to explore the decks set aside for passenger accommodation, I was in danger of being lost. With her magnificent dining rooms and saloons, lounges, well-fitted cabins, recreation rooms, shops, libraries, swimming pools, and play rooms for children, '*Queen Mary*' is indeed a floating city. There is even a hospital, and I was not at all surprised to learn that enough electricity will be generated in the ship to meet the requirements of a town of the size of Birkenhead.

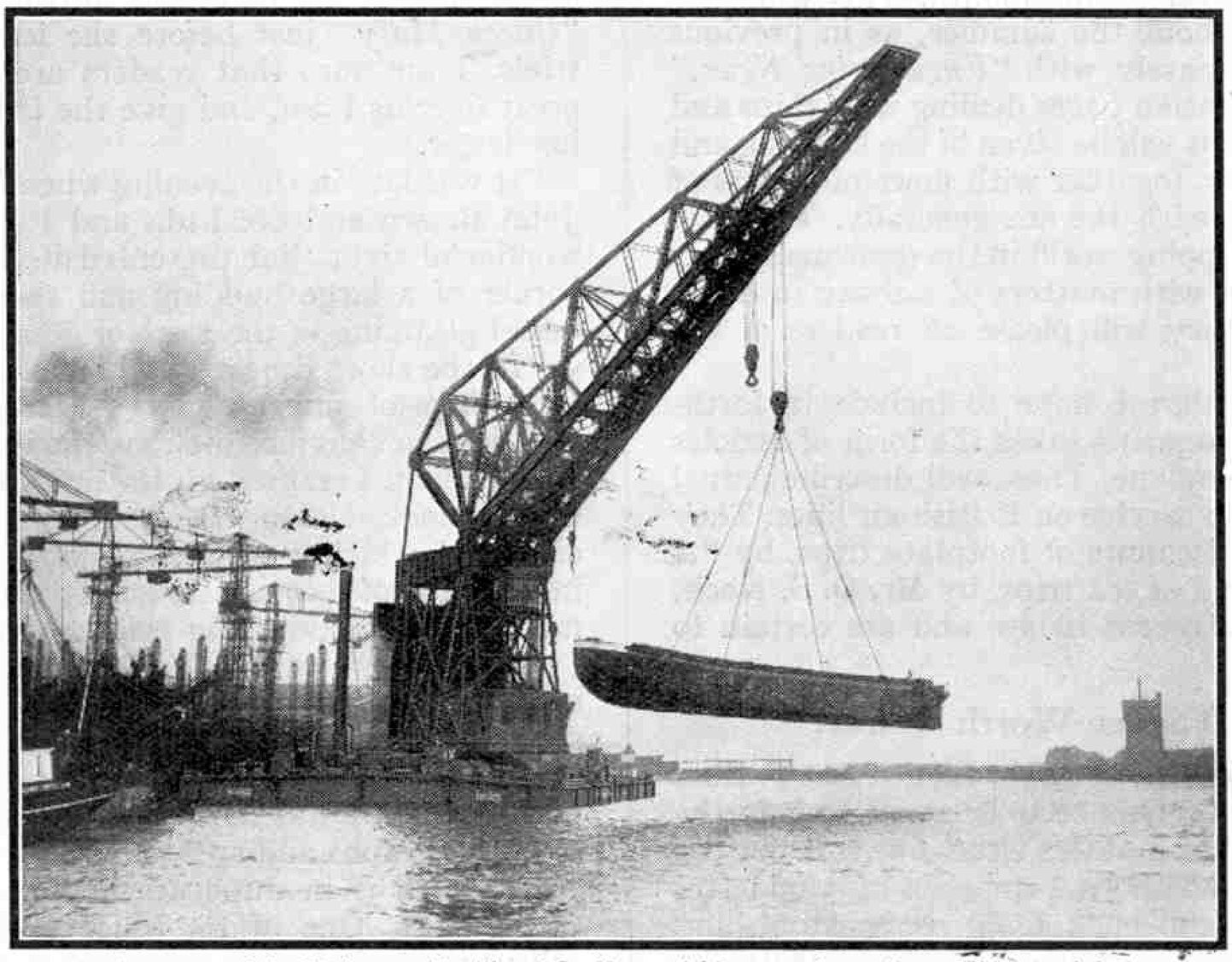
"I should very much have liked to inspect the great turbine engines of the '*Queen Mary*,' and the giant boilers that feed their gargantuan appetites for steam, but the engine rooms were closed."

Floating Cranes and their Work

Giant Strength Under Perfect Control

CRANES and their working are a perpetual source of interest, whatever their size or the purpose for which they are being used. Probably the most interesting member of the large family of cranes is the floating crane, for this usually is capable of dealing with immense loads of unusual character. To watch one at work is an experience that is seldom forgotten. Its freedom of movement adds to its fascination, for unlike the majority of land cranes, it can move to the scene of the work it is called upon to do, and it does so more slowly and more majestically than do cranes running on rails. Its only rival in this respect indeed is the blocksetting crane, the operations of which are more restricted in type.

The movements of a floating crane are leisurely, but they are none the less impressive in view of the immense size it usually possesses and the great loads it lifts. In spite of its immense power it is amazingly easy to handle and its electrical or mechanical controls are simple to operate and certain in action, for its capabilities are very carefully calculated when it is being designed.



The floating crane of the Harbour authorities at Le Havre picking up a heavy barge. Photograph by courtesy of Werf Gusto, Firma A. F. Smulders, Schiedam, Holland.

Floating cranes are supported on giant pontoons or hulls in which is accommodated the whole of the machinery for operating them in addition to that required for moving them through the water. They differ from land cranes in that they are not rigidly supported, for the position of the pontoon in the water varies with the movements of the jib and other moving parts, and of the load carried. In most cases the hull is so large that only a slight list follows the transference of weight accompanying these movements, but in others compensation is applied by pumping water ballast from one compartment to another in order to preserve a balance.

Floating cranes are not adapted for operations in rough weather. Their speed usually is up to 5 m.p.h., and often it is essential that they shall be attended by tugs to allow them to be manœuvred into position. They are used chiefly for special loading or unloading work, or for building or maintenance operations in connection with docks and harbour systems. An excellent example of the kind of service for which they are fitted is in installing boilers and engines in ships. The weights of the parts of these handled by a floating crane are very large, and these structures prove especially useful in lifting them from the dockside, to which they have been brought after erection, directly into the vessels themselves. Their use for this purpose saves both time and money, for otherwise it might be necessary to dismantle the boilers or engines, and to re-erect them in the ship, a tedious and wasteful method.

A floating crane of great interest that has accomplished many remarkable feats is shown on our cover this month. It is the *"Mammoth"* of the Mersey Docks and Harbour Board. This crane is fitted with triple expansion marine type engines that give it a speed of nearly 5 m.p.h. It is of the derricking jib type and is capable of handling loads up to 200 tons. It was built in Holland by Werf Gusto, Firma A. F. Smulders, and was towed from Schiedam to Liverpool without the jib being dismantled.

On one occasion the *"Mammoth"* transported across the Mersey part of a lock gate weighing 190 tons. This was the gate of the Alfred Dock, Birkenhead, which required strengthening and repairing and was removed to the Brunswick Dock, Liverpool, for this purpose. When the necessary work had been completed, half of the gate was transferred back to the Alfred Dock by the *"Mammoth,"* and the second half was afterwards taken across the river without difficulty. On each occasion the half gate was lifted from the dock wall and swung on to the deck of the floating crane, where it rested in an improvised cradle. Three tugs were then employed to take the *"Mammoth"* across the Mersey with its great load. Two of these were ahead of it and the third was astern.

Other noteworthy feats accomplished by the *"Mammoth"* have included the removal and replacement of bridges connecting the floating stages at New Brighton and Egremont with the piers giving access to them. These floating stages rise and fall with the tides and carry with them the outer ends of the bridges, the bearings of which are giant hinges that allow for the varying inclinations of the structures. In work of this kind the state of the tide has to be taken into consideration, and the bridge connection is made immediately the tide has risen to its full height, which of course is accurately known from the work of the tidal observatory of the Mersey Docks and Harbour Board on Bidston Hill, Birkenhead. Several years ago a bridge weighing 152 tons was placed in position at New Brighton Ferry, and more recently an existing bridge was removed for reconstruction and the rebuilt bridge, weighing 110 tons, was placed in position with the aid of the *"Mammoth."* The bridge installed at Egremont to connect the floating stage with the pier, also weighs about 110 tons.

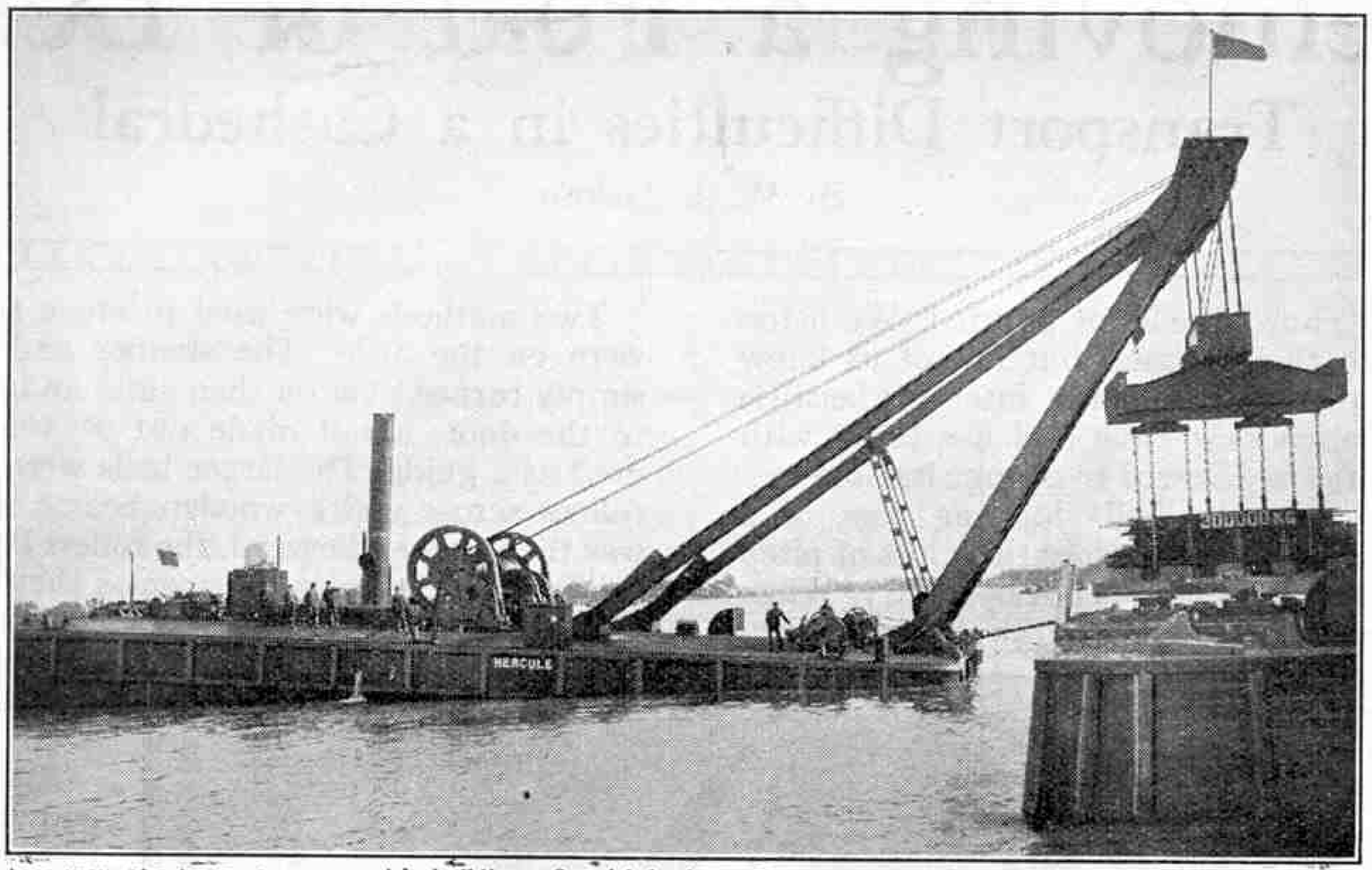
A second 200-ton floating crane of similar design and appearance to the *"Mammoth"* was constructed by the same firm for the harbour authorities at Le Havre. This crane is capable of hoisting a load of 200 tons to a height of 160 ft. above the water line at a distance of 95 ft. from the centre line of the crane. Alternatively, a load of 150 tons can be hoisted at a distance of 130 ft. from the centre line.

There are two main hoisting blocks, each capable of handling a load of 100 tons, and the two are coupled together when the maximum load of 200 tons is to be lifted. The hoisting speed of these blocks is 4.5 ft. per minute. The winches are provided with strong electrical brakes that ensure safety in all operations, and the crane driver's cabin is situated under the jib in order to give him an uninterrupted view of his work. In spite of its great size, only three men are required for operating the crane, and a special switching system is incorporated in order to make the control as simple and safe as possible.

Steam is supplied by a boiler with a working pressure of 147 lb. per sq. in. This is situated in the pontoon, which also carries a triple expansion steam engine with surface condensers and the dynamos that supply the necessary current.

A more powerful floating crane, also built in Holland, was employed in the construction of harbour works in Spain. Blocks of stone or concrete of enormous size are necessary for breakwaters

and jetties, which have to withstand the pounding action of the waves in stormy weather. These usually are placed in position by giant blocksetting cranes running on rails laid down for the purpose. This method could not be followed in the case of the Spanish harbour works referred to, and instead this powerful floating crane, known as the *"Hercule,"* was used. Blocks of concrete weighing 260 tons had to be placed in position. These were made on shore and carried by a travelling gantry to the water side, where the *"Hercule"* lifted them on to heavy pontoons that were towed to the site of operations. There the crane again lifted the block and placed it in position.



Side view of a floating crane used in building a Spanish harbour. The crane is shown lifting a test load of 300,000 kg., or about 300 tons. Photograph by courtesy of N. V. Intern, Scheepsbouwmij "de Maas."

The pontoon of this giant crane is of immense strength. It is 115 ft. 6 in. in length, 57 ft. 6 in. in breadth and 13 ft. 1½ in. in depth. An illustration of the crane lifting a load of 300,000 kg., or about 300 tons, is reproduced on this page. It will be noticed that the deck of the pontoon is not horizontal, its forward end being depressed owing to the distribution of the load supported. The deck of this floating crane in fact is never horizontal, whether the pontoon be loaded or light.

The increasing tonnage of modern vessels and the growth in size of the dock equipment necessary to deal with them have led to the construction of larger floating cranes. An interesting example of a modern giant floating crane was constructed in 1924 by Cowans, Sheldon and Co. Ltd., Carlisle, for a Japanese shipyard, and a second floating crane actually was employed in erecting it.

This giant crane is capable of lifting a load of 350 tons at a radius of 100 ft., or 300 tons at a radius of 121 ft., and of revolving through a complete circle with the load in position. The vertical distance through which these heavy loads can be raised is 140 ft. The main loads are lifted on two blocks, each of 175 tons capacity, and these may be used either together or independently as required. Auxiliary lifts of 50 tons also are provided. One of these gives a vertical lift of 200 ft., and the other is capable of traversing its load horizontally through a distance of 75 ft. The provision of these auxiliary lifts enables comparatively small loads to be lifted at high speed.

The jib is capable of derricking in from the maximum radius of 121 ft. to a minimum radius of 50 ft., and when in this position the height to the top of the crane is 240 ft. A roller path with a diameter of 50 ft. forms a mounting for the crane, which can be revolved with its load through a complete circle in either direction. The superstructure consists of a rectangular braced frame 66 ft. in height that supports the jib, which is raised and lowered by means of two steel screws 49 ft. in length and 14 in. in diameter, placed at the back of the crane and driven from the engines through a train of gearing. The lifting gears are fitted with specially designed hydraulic brakes to control the lowering of the loads.

The pontoon is 270 ft. in length and 90 ft. in width, with a draught of about 10 ft. It is so large that the provision of moving or water ballast is unnecessary. Behind the crane is a large deck area on which a load of about 700 tons can be carried. The propelling machinery, which is placed amidships, consists of twin screw compound engines supplied with steam from boilers working at a pressure of 150 lb. per sq. in. The hull is built of steel, and is divided by bulkheads into watertight compartments. Its deck equipment includes a steam windlass, capstans, steam and hand-steering gear, lifeboats and everything necessary for a sea-going vessel.

The 150-ton floating crane "London Mammoth" engaged on the shipment of railway coaches for South Africa. Photograph by courtesy of the Port of London Authority.

A great floating crane that works on inland waters was specially constructed a few years ago in Canada. It is capable of lifting a load of 500 tons, and its purpose is to remove the gates of the locks of the Welland Ship Canal when necessary, and to lower new gates into position. Some of these gates are of enormous size, those at the lower ends of some of the locks of this waterway consisting of two leaves, each weighing nearly 490 tons.

The pontoon of the floating crane is 90 ft. in length and has a width of 66 ft. In order to remove the leaf of a lock gate, it must be lifted vertically. The pontoon therefore has been designed with a blunt end that can be brought close up to the leaf to be hoisted. The frame used for lifting consists of two columns, suitably stayed and braced, at the blunt end of the pontoon. Across the top of the columns is a girder carrying eight sheaves, each 9 ft. 6 in. in diameter, over which pass the ropes supporting an equalising beam carrying a lifting pin that can be engaged with eyes on the gate. After passing over the pulleys at the top of the frame, the ropes are taken to a second set at the base, where their direction is changed to the horizontal to enable them to be connected to the lifting mechanism. Since the pontoon is comparatively short, ballast must be removed in order to keep it on an even keel during hoisting operations. Water is used for this purpose and the vessel is trimmed by pumping it as required into the forward or aft tanks.

The gate lifter is equipped with a boiler in which oil or coal may be burned. Steam is supplied at a pressure of 155 lb. per sq. in. to a vertical compound condensing steam engine that drives a 200 kw. 230v. generator. This generator supplies the power for the main gate hoist and also that required for the capstans, pumps, heaters and auxiliary derricks. The crane is towed from place to place as required by tugs, but otherwise is a self-contained unit. One reason for the use of a short pontoon of curiously stubby form is the necessity for negotiating the comparatively narrow waters of the canal and the entrances to the locks. In this respect the crane is unlike others of the same type, practically all of which are designed to operate in the spacious waters of harbours and estuaries.

Removing a Peal of Bells

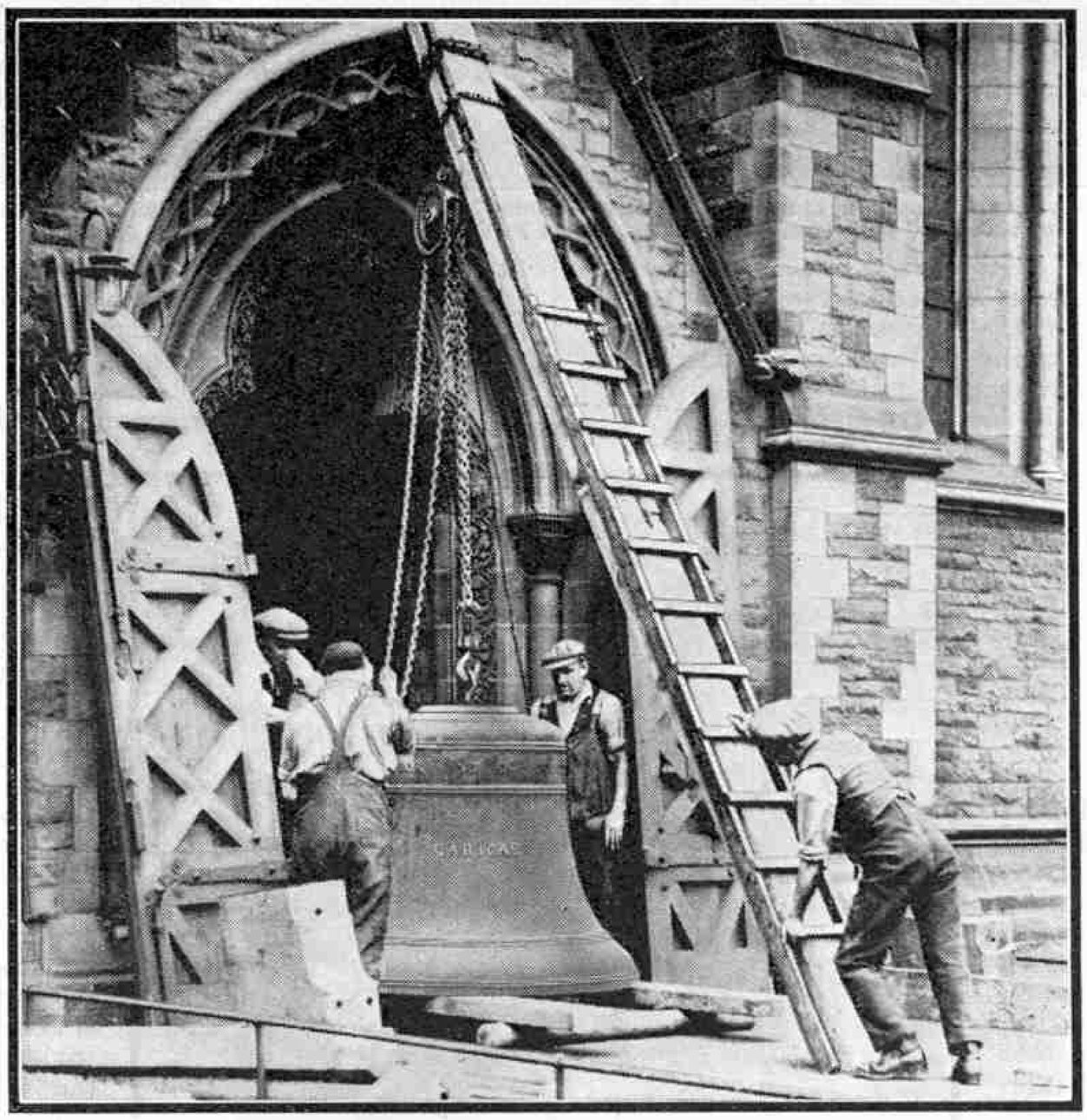
Transport Difficulties in a Cathedral

By W. J. Aitken

MOST of us take church bells for granted. We listen with pleasure to their chimes, but few of us know that it is necessary to re-tune them at intervals because of the lowering of pitch that time and use bring with them. A single bell may be allowed to change its note to a considerable extent, but the bells forming part of a peal must be kept in tune. Fortunately their loss of pitch is gradual, and frequent re-tuning is not necessary. When the bells of St. Mary's Cathedral, Edinburgh, were taken down for treatment, therefore, I carefully watched their removal, for an opportunity of seeing how great bells are handled does not occur every day.

The peal of bells of St. Mary's Cathedral was installed in a belfry in the Central Spire, which is 275 ft. high and weighs 6,000 tons, its foundations being 60 ft. deep. The belfry itself is 100 ft. above the ground. The 10 bells forming the peal were cast by J. Taylor and Co., Loughborough, and each was given a name. The smallest is *"Humilitas,"* which weighs 7 cwt. 31 lb., and the three next lightest are *"Fides," "Contentia"* and *"Patientia,"* weighing 8 cwt. 56 lb., 8 cwt. 104 lb. and 9 cwt. 105 lb. respectively. Then follow *"Reverentia,"* 11 cwt. 97 lb., and *"Pietas,"* 15 cwt. 12 lb. Each of the remaining four bells weighs more than a ton. They are *"Spes,"* 21 cwt. 35 lb., *"Pax,"* 24 cwt., *"Grandium,"* 29 cwt. 76 lb., and *"Caritas,"* the giant of the peal, which weighs 2 tons 2 cwt. 77 lb. Thus the total weight of the peal is nearly 9 tons.

After each bell had been detached from its mounting, it was lowered from the belfry into the Bellringers' Chamber below, and then passed through a trap-door in the floor, which is 5 ft. above the roof of the Cathedral itself. It was next passed through a hole in this roof and then lowered to the ground, a distance of 70 ft., by means of a hand winch, reaching the floor in the middle of the choir stalls, which are raised a little above the level of the main aisle to which the bells had then to be removed. It was necessary to traverse the aisle in order to reach the north door, through which they were to be taken out of the building.



"Caritas," the largest of the bells of St. Mary's Cathedral, Edinburgh, being lowered on to rollers after it had been brought through the doorway. This bell weighs more than two tons.

Two methods were used to move the bells, once they were on the aisle. The smaller and lighter ones were simply turned over on their sides and rolled on their rims to the door, a rail made out of wooden beams being used as a guide. The larger bells were lowered on to two rollers across which wooden beams were laid. The bell was then pushed forward, the rollers being replaced under the front of the beams as soon as they became free at the back. A little manœuvring was necessary at the junction of the main aisle and the passage leading to the north door.

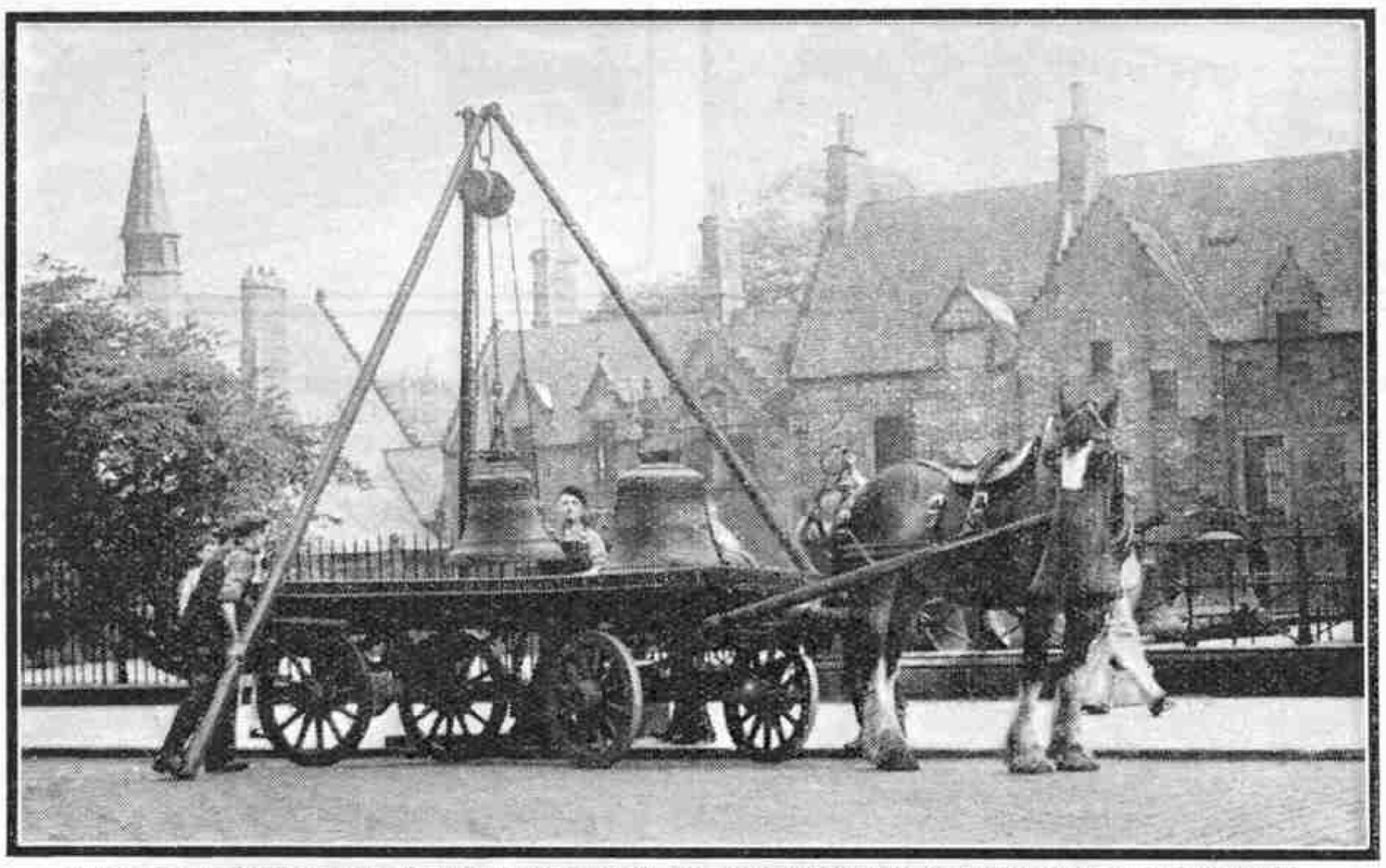
Another difficulty then had to be overcome before the bells could be taken out of the Cathedral, for a few steps led from the doorway to the path outside. When dealing with the smaller bells it was possible to construct an incline of beams, down which they could be rolled slowly. The heavier bells could not be safely moved in this manner, and each of these in turn was brought out beyond the steps on projecting beams that were kept level with the floor of the main aisle. The bell was then lifted up by means of a pulley block fixed above it, as shown in the illustration on this page; the beams were removed, and the bell was lowered to rollers on which it was conveyed as near as possible to the gate at the end of the path, there to await the lorry on which it was to be taken away.

Nine of the 10 bells comprising the peal were brought out to the path in this manner, and then the task of loading them on the lorry commenced. As the bells had to be raised through a height of about 4 ft., a tripod was set up just outside the gate and a pulley block was suspended at its apex. The bells were then brought one by one to the edge of the pavement, and each in turn was pushed under the pulley and then raised while the lorry was backed in under it and between the legs of the tripod. The bell was then lowered as near to its assigned position as possible, but sometimes much pushing and pulling and repeated liftings and lowerings were necessary before the weight was distributed in the best possible manner.

The task of despatching the nine lighter bells occupied the working hours of a Saturday morning, and the

largest bell was then left in the belfry. This was "*Caritas*," the tenor bell, which weighs considerably more than two tons, and its removal was undertaken on the following Monday. With great precautions it was lowered through the Bellringers' Chamber down to the choir stalls, and equally careful handling was required to get it safely to the main aisle. On account of its great weight this bell was extremely difficult to propel in the ordinary manner, and it was necessary to lever it along by means of a wooden beam.

All went well until the junction of the main aisle and the passage leading to the North Door was reached, and there half an hour's patient work was necessary, for it was impossible to take the bell in a gentle curve round the corner because of the limited space available. The method eventually adopted was to run the bell to a point level with the middle of the passage leading to the door and then to turn it round, together with its supporting beams and rollers, until it could be moved in the required direction. For this purpose each of the two beams on which it rested was levered up in turn and the rollers were hammered round a few degrees. The levers were then moved to a position under the bell itself, and this was lifted while the beams supporting it again were placed at right angles to the rollers. This process had to be gone through several times before the bell at last was in a position to be rolled to the door.



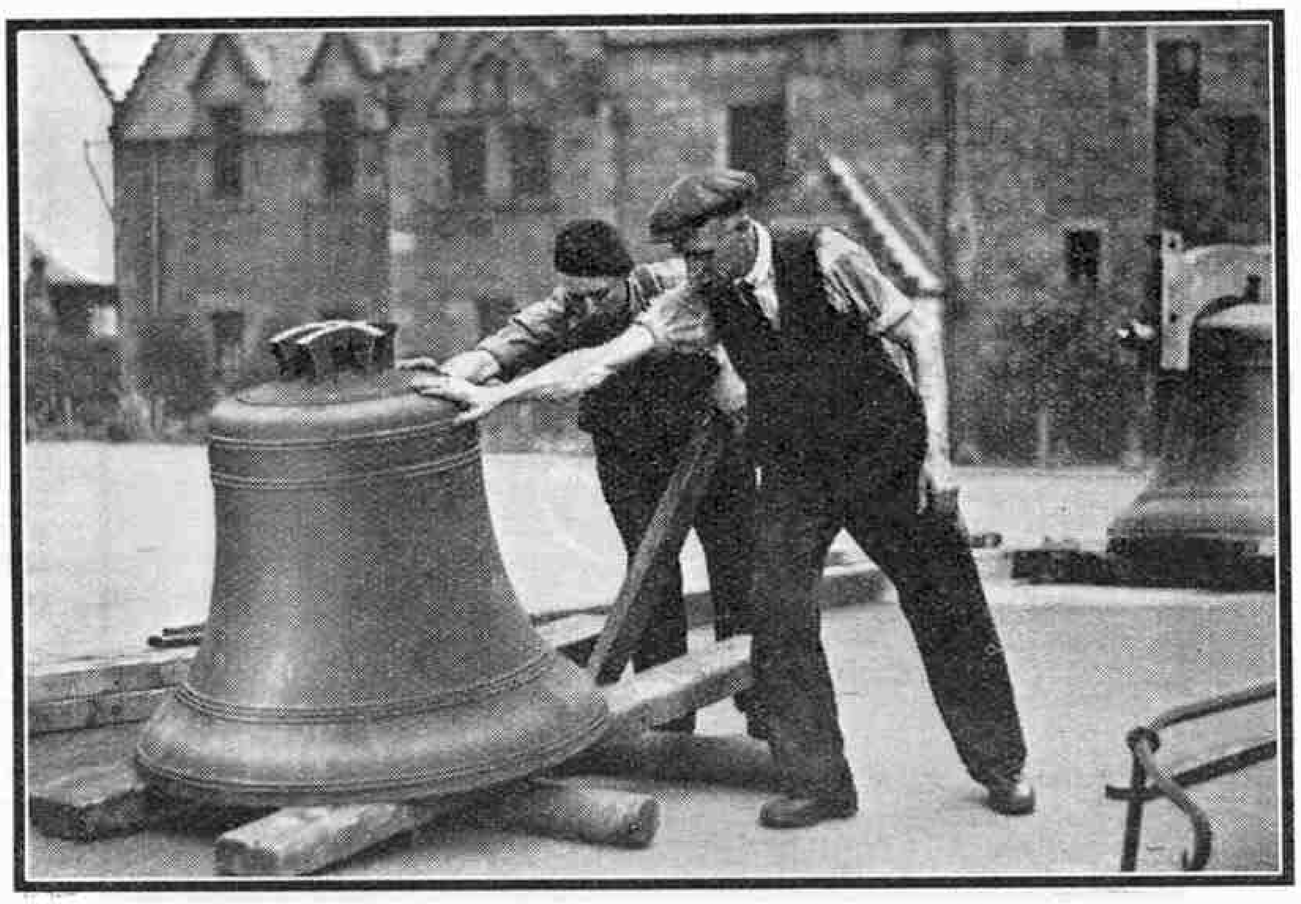
Loading one of the bells on to a lorry for removal. Care had to be taken to distribute their weight evenly.

A large block of wood, 12 in. wide and nearly 18 in. thick, was fastened to the bell, and this had now to be removed, for the doorway was too narrow to allow it to pass through. Its removal appeared to be a simple task, for it was secured only by four large nuts and bolts. It was soon realised that to unscrew the nuts was far from sufficient to release it, however, for two of the bolts had become firmly rusted to a metal plate that was sunk below the surface of the wood, and there was little hope of removing them by any ordinary means.

After a short consultation, it was decided that the only way to separate the wood from the bell was to saw through the timber on each side of the bolts, and then to chip away the wood that remained, so that the troublesome bolts could be removed. After much hard work with the saws, only the wood to which the bolts were fastened remained, and on chipping that away, the bolts themselves were exposed to view and were then quickly cut through by means of a hacksaw.

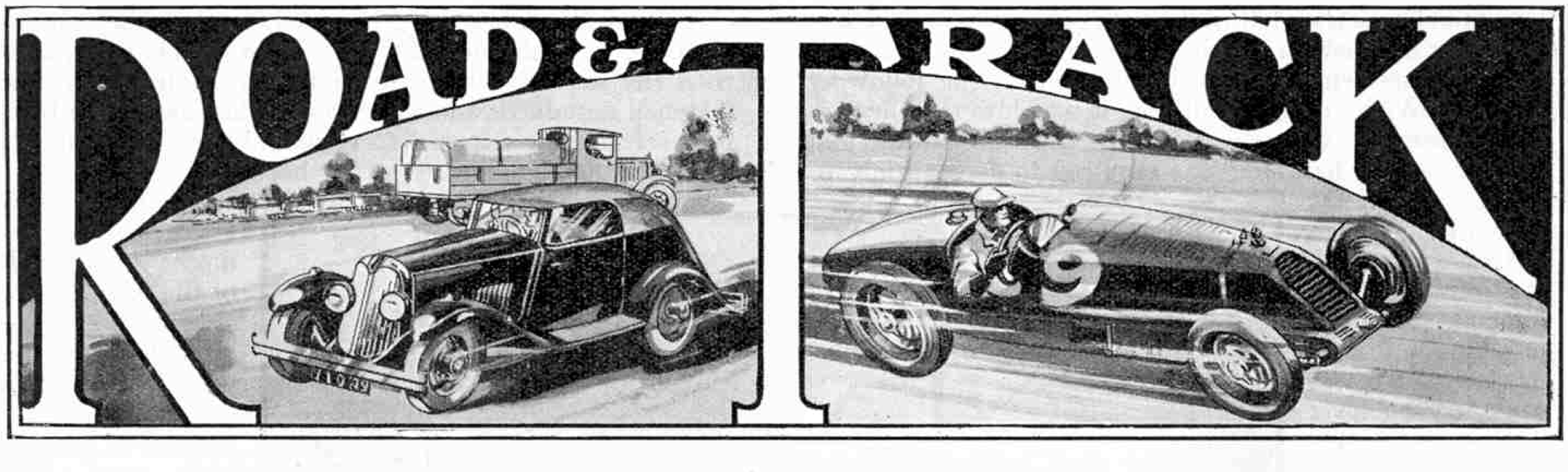
In the meantime measurements were made of the width available between the large doors, as this was found to be inadequate for the passage of the bell while level, even when the heavy doors had been taken off their hinges and temporarily removed; and it was necessary to tilt the bell to one side. A block and tackle therefore was erected just inside the doorway. With this "*Caritas*" was raised about 2 ft., and beams and planks were piled at one side of the passage to provide the necessary tilted path on which the bell could be conveyed outside. When the track was ready, the rollers and beams on which the bell was to rest were put in position, and the bell was lowered on to them, levers being used to prevent it from slipping down the tilted track.

When the plans and preparations for the task had been checked over, two men took up their positions behind the bell, and slowly levered it forward, the others acting as guides. There was an anxious moment when the bell slipped a little sideways down the slope of its tilted track, but its movement was checked immediately, and it was soon levered back to its proper level. Apart from this everything went smoothly, and before long the bell was through the doorway and clear of the steps. The pulley tackle inside the church was then dismantled and reassembled outside the door, so that the bell could be raised to allow the tilting track to be dismantled and the rollers to be set level, when it was again lowered on to them.



Moving a bell on beams and rollers. Each roller was replaced in front when it became free at the back.

The difficulties of handling this giant bell were now almost over. There was an awkward corner on the path leading to the roadway, but before long the bell was safely on the pavement, and like the others, it was hoisted on the lorry and was soon on the way to Loughborough to have its tune restored.

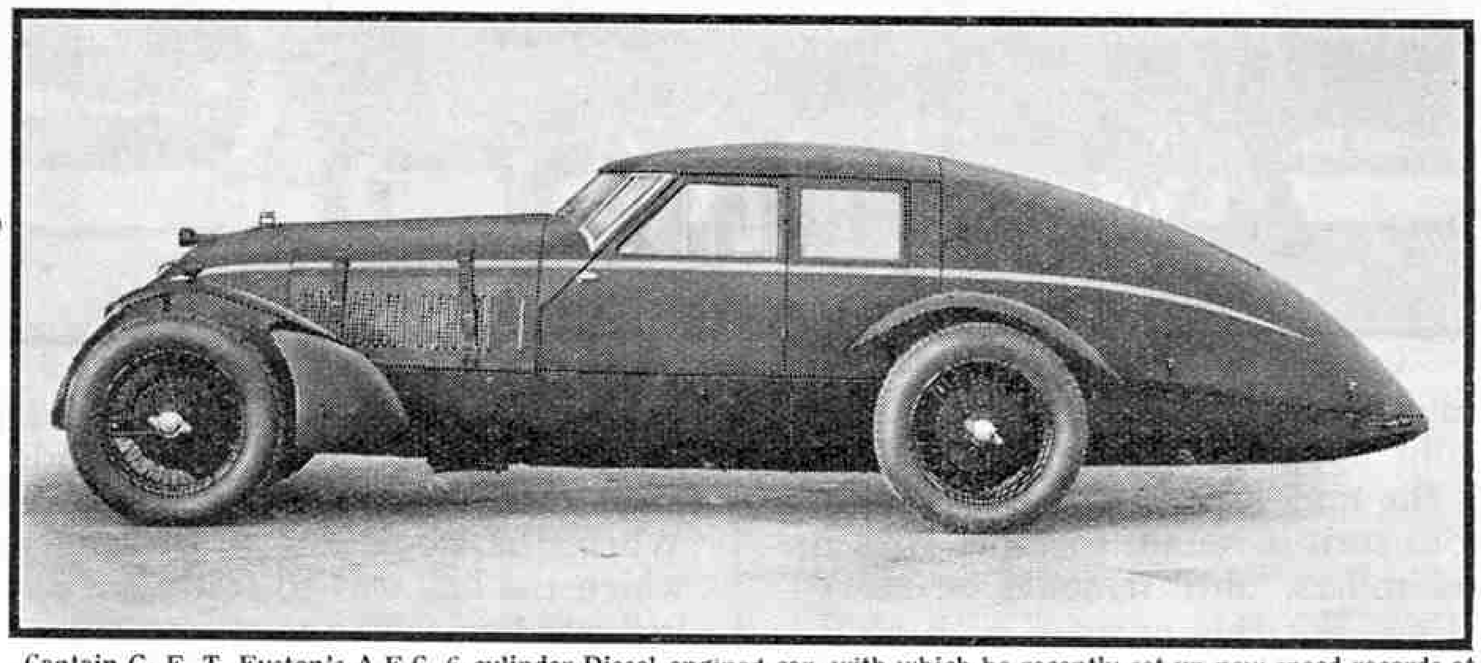


Diesel-Engined Car Records

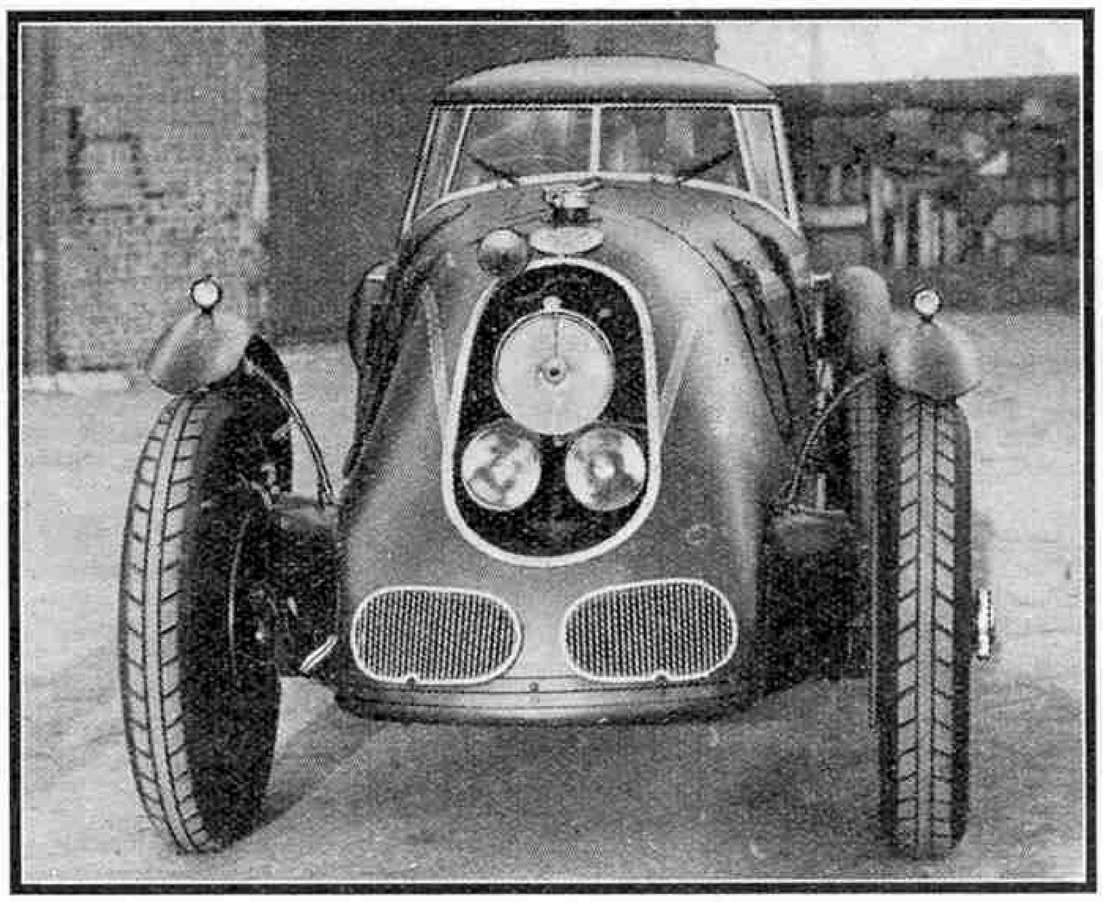
Captain Eyston's recent success in establishing 12 records for a Diesel-engined car augments still further the already imposing list of land speed records held by this country. This famous racing motorist, with his co-driver Mr. A. Denly, at the Montlhery track near Paris completed a 24-hours' run at an average speed of 94.99 m.p.h. The car used was a four-seater streamline saloon fitted with a standard A.E.C. 6-cylinder Diesel engine, similar to those used in London omnibuses, and new records were set up also for 50, 500 and 3,000 kilometres, for 500 miles, and for 6, 12 and 24 hours. Rain and intense cold made conditions very difficult in the later stages of the attempt.

It is pleasing to note that Captain Eyston has been awarded the Segrave Trophy, which was established in memory of Sir Henry Segrave, the great English motorist. The Trophy is awarded annually to a British subject who has upheld British prestige by actions requiring great courage and skill, and directed towards the development of land, sea or air transport. Previous holders of this trophy include Mrs. Mollison, Commander Kingsford-Smith, Mr. Waller and Squadron-Leader Hinkler. The only racing motorist who has previously received the honour is Sir Malcolm Campbell, to whom it was awarded in 1933.

Most of the land speed records are now held by Great Britain, and the keenness with which these are sought is shown by the fact that during last year no fewer than 222 successful attempts were made to set up new records. The most spectacular of these events of course was the fine performance of Sir Malcolm Campbell in attaining the amazing speed of 301.139 m.p.h. over a measured mile. During the last 10 years Sir Malcolm has successfully attacked the existing mile record no less than eight times, and has held it continuously since 1931. During the last five years he has broken his own record on four occasions.



Captain G. E. T. Eyston's A.E.C. 6-cylinder Diesel-engined car, with which he recently set up new speed records at Montlhery. We are indebted to the Associated Equipment Co. Ltd., Southall, for this illustration and the one below.



A front view of Captain Eyston's Diesel-engined record-breaking car.

Rivals to "*Bluebird*"

Now there are rivals in the field. Sir Malcolm's record will be attacked in no uncertain manner this year by two famous British racing motorists, one driving a 5-ton giant car and the other a machine weighing only 30 cwt. The heavier car will be driven by John Cobb, and the small one by F. W. Dixon, and the attempts will be made on the Bonneville salt flats at Utah, between July and September next. Cobb is having a new car designed for him by Mr. Reid Railton, the designer of the present record holder's famous car "*Bluebird*," and it will have two Napier aero engines, probably developing a total of about 2,000 h.p. Dixon's car will be no heavier than an ordinary private saloon and not much bigger.

In view of the fact that German racing machines weighing only 15 cwt. and of 30 to 35 h.p. last year attained speeds of 200 miles an hour during ordinary road races, Dixon believes that it is possible to get from a car of twice the weight well over 300 m.p.h. on the perfect course provided by the salt beds of Utah. Sir Malcolm Campbell has recorded that during his record runs at Bonneville he seemed to be skimming through the air, for the surface does not drag so much as the sand of the course at Daytona he used formerly. His chief anxiety was in regard to pulling up, and he had to take the risk of braking when travelling at 250 m.p.h. Dixon's lighter car will be much easier to deal with in this respect.

Record Load for World's Largest Lorry

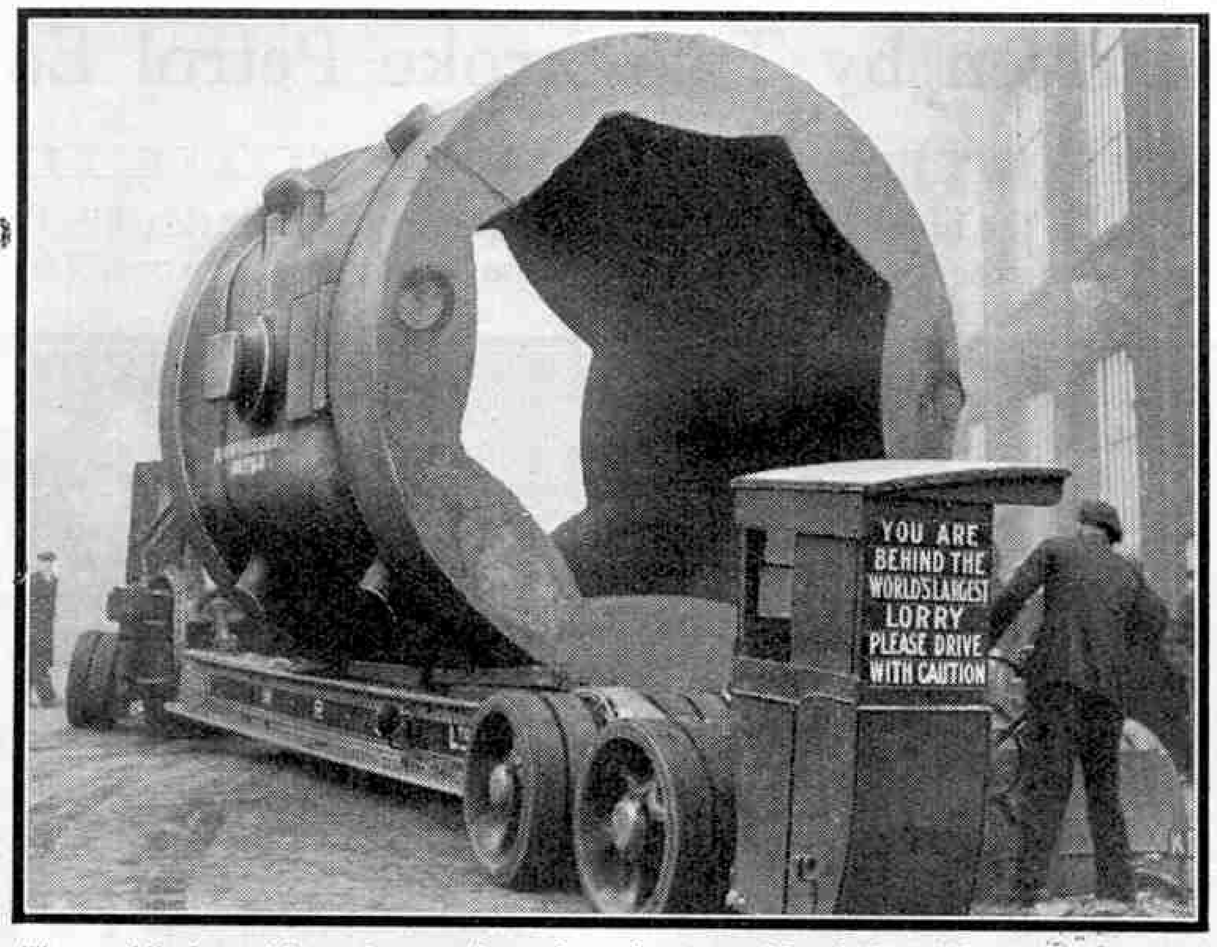
Turning for a moment from speed events, I think readers will be interested in a very different kind of record that was set up recently by the giant 14-wheeler Scammell Lorry owned by M.R.S. Ltd. and claimed to be the largest in the world. In the upper illustration on the opposite page this lorry is shown making its way through the streets of Sheffield carrying a huge ingot mould weighing 165 tons. This load was the heaviest the 14-wheeler has yet been called upon to handle.

Elaborate arrangements had to be made to ensure a safe passage when taking this giant ingot mould from the makers' works to the Vickers Works of the English Steel Corporation Ltd., a distance of just over a mile. The vehicle set out on its journey at 6 a.m., and travelled over icy roads with an escort of officials, and police in front and rear. The average speed was about 2 m.p.h. The passage through the gateway at the Vickers works required very skilful manipulation, particularly on the part of the rear steersman on the vehicle.

An exciting moment occurred when a right-angle turn and a slight lump of the road caused a momentary halt, during which smoke rose from the burning surface beneath the revolving driving wheels.

Highway Construction in Germany

The great scheme of road construction that is now in progress in Germany is going ahead so rapidly that nearly 2,000 miles of road will be ready for use this summer. Two great thoroughfares from north to south will then have been created and these will have two east to west connections, one in North Germany and the other in the south. The part of the scheme now in hand embraces some 4,375 miles of new roads that will link up the important economic centres of Germany. These roads will be built to a standard form of construction, with two separate carriageways, each 25 ft. in width, divided by a 16 ft. sward that will be planted with trees or bushes to shield drivers from the glare of the headlights of approaching vehicles. Intersections will be avoided by means of bridges and viaducts, and special turnings will be built to allow cars to leave or join the road without having to cut across the main highway.



The world's largest lorry transporting a huge ingot mould weighing 165 tons. Photograph by courtesy of M.R.S. Ltd.

Novelties at the Berlin Motor Show

Keen interest is being displayed in Germany in every branch of motoring, and this was evident at the great Berlin Motor Show, held in February. As usual the exhibits covered a very wide range, extending from small private cars to heavy transport vehicles produced for special purposes. The influence of Germany's wonderful new motor roads, already referred to, is reflected in the speeds for which the latest vehicles, both private and commercial, are designed. Many of these are capable of speeds in the neighbourhood of 70 m.p.h., and are fitted with engines of 150 to 300 b.h.p. It is particularly interesting to find that there were no fully streamlined designs, however, and only in the wings were there any of the sweeping curves that were so popular in body design a year ago.

The number of vehicles fitted with Diesel engines showed an increase over the number exhibited last year, and probably the most important exhibit in the show was the first private car with a heavy oil engine to be produced as a regular model by a well-known firm. This is of Daimler-Benz make and has a four-cylinder engine of 18 h.p.

A feature of the exhibition was the number of cars with engines so designed that they can by a slight alteration be made to operate on gas. One gas-operated machine on view was a municipal refuse collecting vehicle, and the gas is carried in six cylinders, arranged across the chassis, that hold sufficient gas for a run of about 40 miles. Other cars shown were equipped with gas producer plants, and one vehicle in this class is a 20-ton high speed lorry fitted with an engine of 110 h.p. running on gas supplied by an anthracite generator. For this vehicle it is claimed that even after standing idle for several days there is sufficient heat left in the generator for gas to be produced in a few minutes.

Other interesting exhibits included vehicles designed for railway and post office service. One of these, a complete mobile post office, is provided with counter, large extension tent with three demountable telephone booths, and a large electric clock. Another is equipped as a sorting office, with hundreds of pigeon-holes for the letters and a letter slot at the side. Both these vehicles are of Mercedes-Benz make.

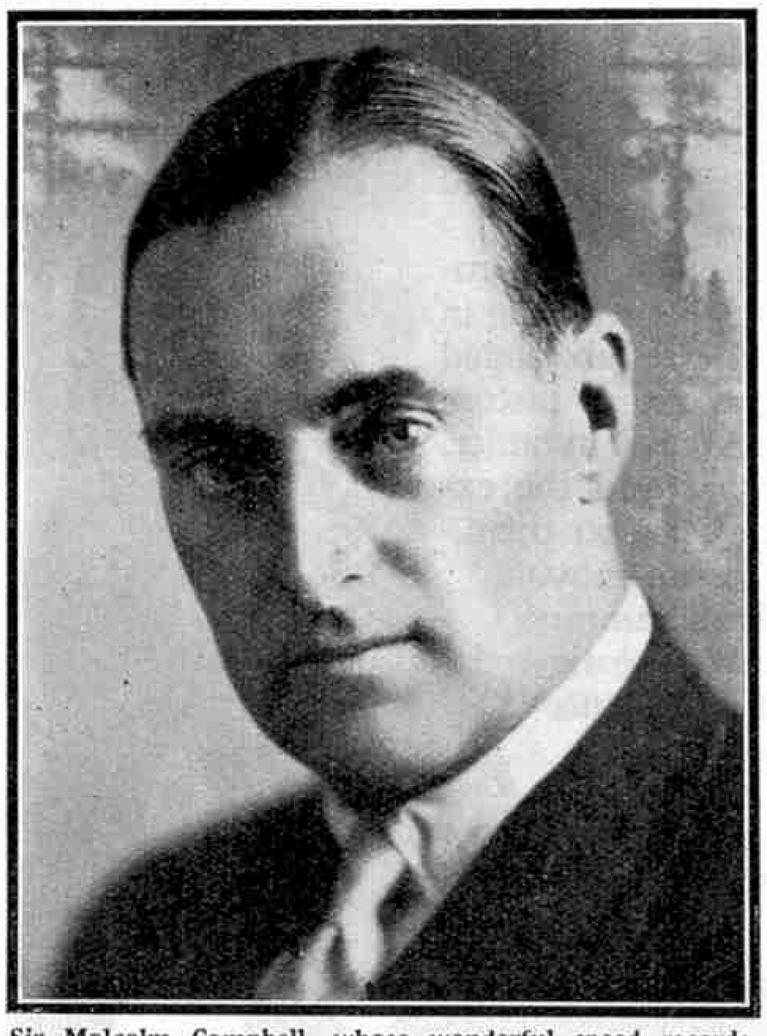
In the accessories section were to be seen some tyres and tubes made from a synthetic rubber known as "Buma." The tyres had made severe journeys of over 6,000 miles and showed no appreciable signs of wear. This is the first time that tyres made from the new material have been included in the Berlin Show, although experiments in its manufacture have been in progress for the past 12 years.

The 1936 Monte Carlo Rally

This year's Monte Carlo Rally proved as popular as ever, and attracted drivers from all parts of the world. In this event competitors are given a choice of starting points in various parts of the Continent and the British Isles, and bad weather or poor roads, or a combination of both, often have made matters very difficult for those taking part. It is of interest to note that the route from Athens, which is about 2,500 miles and usually offers the most arduous conditions, this year proved comparatively easy, while the route from John O'Groat's, generally regarded as easy, provided the greatest difficulties owing to blizzards encountered in Scotland.

The main feature of the results was the success that attended Ford cars. Of 23 Fords entered, 16 managed to complete the course, and four of them were placed first, fourth, sixth and ninth, the general classification event being won by a Rumanian driver P. G. Cristea, driving a Ford V.8. The best performance by a British driver was made by Mr. D. Healey driving an eight-cylinder Triumph Dolomite.

In the coachwork and comfort competitions, held at the end of the Rally, British cars scored notable triumph. First prizes were won by Wolseley, Lagonda, Triumph and Rover cars, and the Grand Prix de Honneur, which is awarded only when a car of exceptional merit is exhibited, was won by a 25 h.p. Wolseley driven by H. E. Symons. The same car also won the comfort competition, a prize offered for the finest class car and a special award for the best finished engine. This car is the first following the difficult route from Athens to Monte Carlo that has won the comfort competition.



Sir Malcolm Campbell, whose wonderful speed records are referred to on the opposite page.

Start of the 1936 Motor Racing Season

Although several important motoring events have already taken place this year on the Continent, the real start of the 1936 racing season, so far as this country is concerned, comes with the British Empire Trophy Race, which is to be decided on 4th April. This event will be followed by the Land's End Trial, starting on 10th April, the B.A.R.C. Easter meeting on the 13th, the Junior Car Club International Trophy Race on 2nd May, and the Light Car Relay Race on 16th May.

On 28th May the new R.A.C. Isle of Man Race will be held. The new race replaces the Mannin Beg and the Mannin Moor Races hitherto run through the streets of Douglas. Entries will be confined to 1½ litre type machines. The event will be run over a road circuit outside Douglas, and is likely to prove far more attractive to the general public than its predecessors.

A Non-Skid Tyre

A new type of motor tyre, which is claimed to possess the valuable quality of freedom from skidding on wet roads, has recently been put on the market.

Instead of the usual complex pattern on the tread the new tyre has a large number of thin flexible peripheral fins $\frac{3}{8}$ in. wide and 1/16 in. apart, and which stand $\frac{1}{4}$ in. high on the tyre. It is these fins that give the tyre its non-skid feature, for under the weight of a car they bend into a snaky pattern with the applied torque of the engine or in braking, and so give a squeegee effect on the roadway and provide better grip for driving or braking.

Moving pictures of cars fitted with these tyres show that they will stop a car dead-straight on a wet pavement at speeds at which cars with ordinary tyres would probably skid badly.

A Self-Contained Road-Breaker

Drill Driven by Two-Stroke Petrol Engine

A FAMILIAR sight in our streets is the breaking up of a roadway, whether of stone or concrete, or of its foundations by means of pneumatic drills, in which compressed air is used to drive down a piston that strikes a digging spike repeatedly, driving it home into the concrete. Usually several pneumatic drills are at work at once, each deriving its supply of compressed air through hose connected to a large compressor driven by a petrol engine.

One of the drawbacks of the pneumatic drill is the size of the equipment and the difficulty of moving it about. This difficulty has now been overcome by the introduction of a road-breaker in which the use of compressed air as an intermediary is dispensed with, the petrol engine acting directly on the digging spike. The new drill is known as the Warsop Petrol-Driven Road-Breaker. It is entirely self-contained, and can easily be handled by one man.

The Warsop Road-Breaker in use. This tool is self-contained, the digging spike being operated by a two-stroke petrol engine. The illustrations on this page are by courtesy of George Cohen, Sons and Co. Ltd.

The power unit of the Warsop Road-Breaker is practically a standard two-stroke motor cycle engine working in an inverted position. The working cylinder is extended downward to accommodate the moving hammer piston, the lower end of which slides in a counter-bored cylinder. The two pistons are opposed to each other and the explosion of the petrol mixture takes place between them. Thus they are driven apart, the engine piston moving upward and rotating the crank shaft, and the hammer piston moving downward to strike the head of the digging spike. The upper piston returns in accordance with the usual cycle of movements of a two-stroke engine, and the hammer piston is raised again by the pressure of gas admitted below it through a port that is uncovered by the engine piston during its upward stroke.

The fuel tank of the Warsop Road-Breaker is in the upper part of the tool, and holds 2½ pints of the mixture of petrol and oil used. The float chamber of the carburetter is concentric with the mixing chamber, a design that allows the machine to be inclined to an angle of 15 deg. to the horizontal without interference with effective operation, and the engine is started by means of a detachable handle that fits on one end of the crankshaft. Ignition is fixed and it is only necessary to operate the throttle while the tool is in operation. This is done simply, for the control is of the twist grip type and is incorporated in the handle, which is on top of the engine casing. A throttle stop is fitted so that the engine can be left to "tick over," or run slowly, when the tool is not actually at work.

A close-up view of the Warsop Road-Breaker at work.

The Warsop Road-Breaker weighs only 78 lb. and consumes about two gallons of petrol and oil mixture in an eight-hour day, or only about one-fifth of the amount that would be used in driving an air drill of similar working capacity. The speed can be regulated between 800 and 2,000 blows a minute, and from 1,500 to 1,800 blows in a minute constitutes an excellent working speed. There is less vibration with it than with a compressed air road breaker, largely because of the absence of mechanical connection between the hammer piston and the engine, and effective cooling is provided by fans on the ends of the crankshaft that draw air through the two.

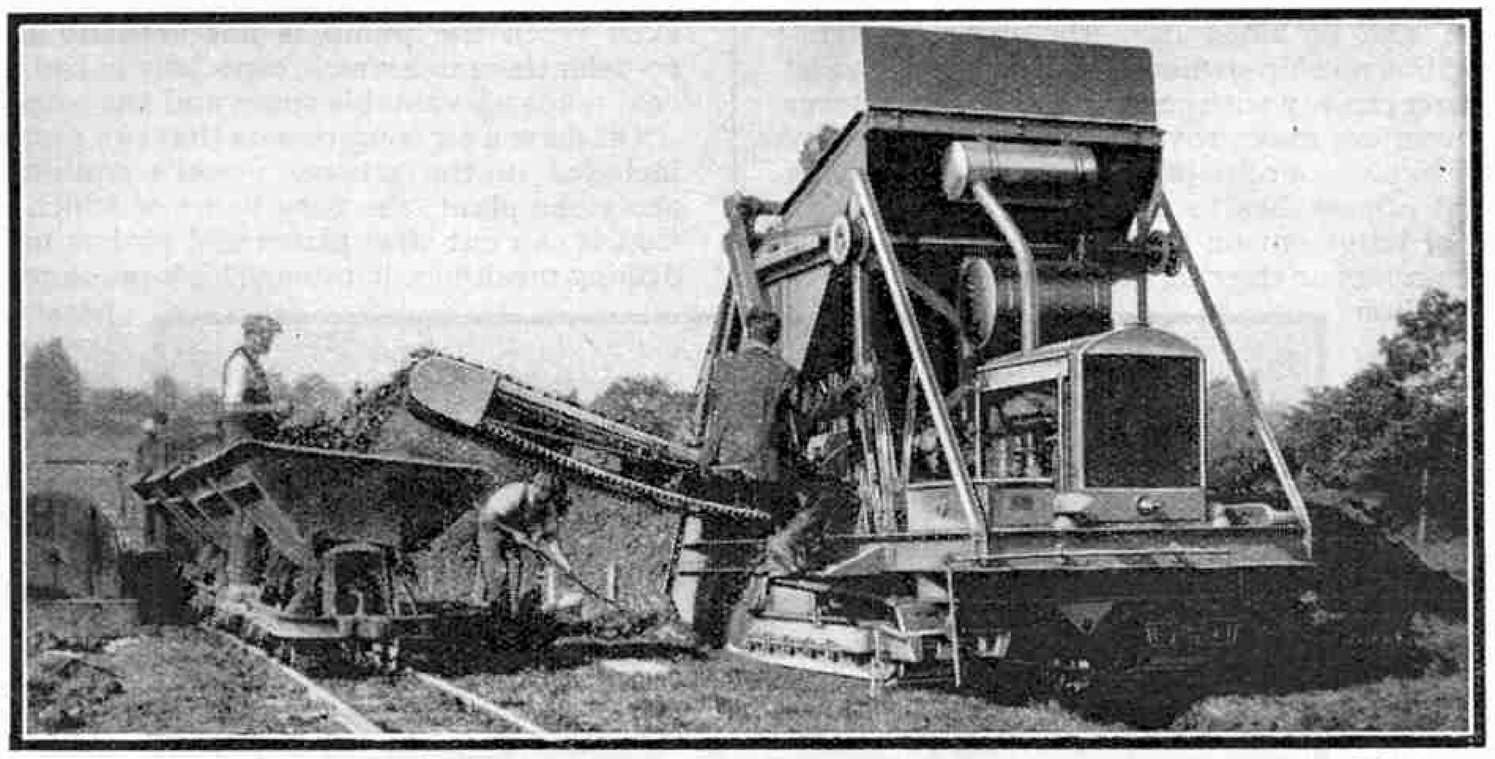
A Warsop Rock Drill working on the same principle as the road breaker also has been introduced. This incorporates a simple mechanism for rotating the drill, and can be used satisfactorily for drilling holes to a depth of 3 ft., but as yet is not suitable for penetrating to greater depths. An interesting feature is that exhaust gases from the engine are employed to clear the hole of dust during drilling operations.

One of the greatest advantages of the Warsop Road-Breaker and Rock Drill is their portability. The scene of their operations can be changed more rapidly and easily than with pneumatic drills, for there are no hoses and other accessories to be moved, and the only interruption of active work that is necessary occurs when the petrol tank requires filling, an operation that takes comparatively little time. Rock drilling in open quarries can be carried out much more quickly with the new tool than with pneumatic drills, for the former can be moved at a moment's notice when a blast is about to take place.

Excavating Narrow Trenches

A Machine with 20 Digging Speeds

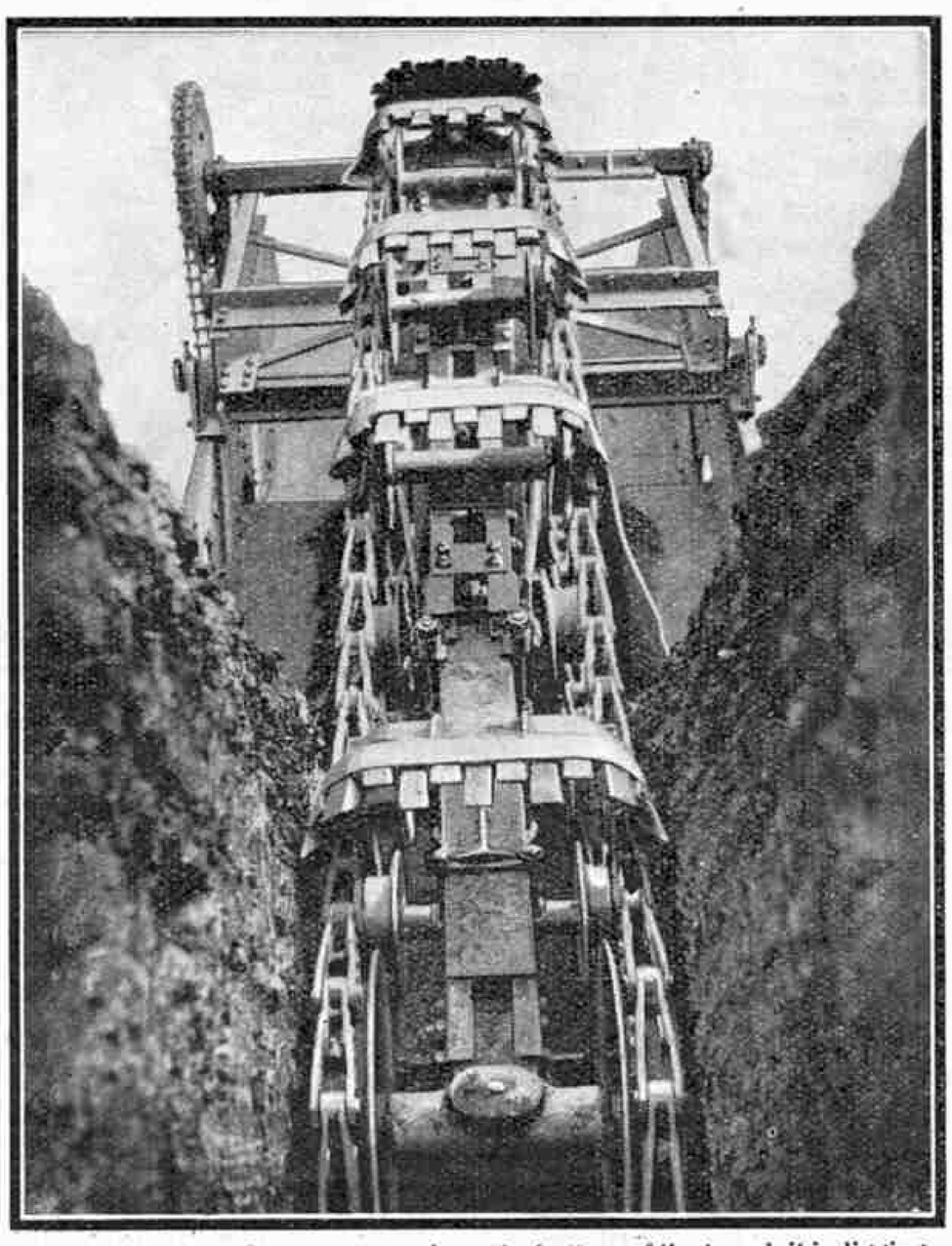
THERE is an ever increasing demand for the provision of gas and water mains, electric light cables and drainage systems, all of which must be laid underground. Most of the trenches required for this purpose are dug at the sides of main roads, and must be as narrow as possible, in order that traffic may not be disturbed unduly, while they are being excavated. They also must be deep, so that pipes or cables laid in them may be protected from mechanical shock due to the passage of heavy road vehicles. These limitations make it almost impossible to dig suitable trenches by manual labour. Excavators designed for this purpose therefore have been introduced, and in addition to digging clean trenches of the exact size required, these have the great advantage of increasing the rate at which the work is done.



The Allen-Parsons Super Duty trench excavator, Model 25, loading trucks with soil excavated from a trench 10 ft. deep. Illustrations by courtesy of John Allen and Sons (Oxford) Ltd.

The Allen-Parsons trench excavator illustrated on this page is an excellent example of a mechanism of this kind, and its digger buckets are capable of digging deep narrow trenches at remarkable speed as they are hauled along the endless chain carried by its boom. For ease in negotiating difficult surfaces, it is mounted on two creeper tracks, which can be started or stopped independently by means of friction clutches; and the entire machine can be swung round in a very small space by simply stopping one of the tracks.

The frame of the excavator is of massive construction and extends to its highest point. The power unit is a four-cylinder petrol engine of 36 h.p., and no difficulty is experienced in cutting through the most stubborn materials met with in trench excavation work. The gear-case is enclosed and is remarkably compact. In many respects it is the most interesting part of the machine, for it transmits the power for actual excavation, for moving the excavator at its work or along the roads, for driving the chain of digging buckets, for operating the conveyor that deposits the spoil, or excavated material, and for hoisting the boom as required. All the movements are under the control of the driver, who from his seat is able to reach the necessary levers without difficulty. The travelling speed of the machine is 1.66 m.p.h., and the 16 forward and four reverse digging speeds provided vary from 11 in. to 139 in. per min.



An unusual view of the excavator from the bottom of the trench it is digging.

One reason for providing many forward gears is to allow the machine to be speeded up or slowed down as the character of the material to be excavated varies. For instance, if this changes suddenly from comparatively loose dry earth to hard clay, the rate of digging and travelling can be immediately decreased. A safety clutch stops work when pipes or large stones are struck. Rapid working in dry soil produces dust, but the casing prevents this from penetrating to the gears and bearings, which are thus protected from undue wear. The lower half of the case is filled with oil, which is sprayed continuously from the top of the case over the gears by means of a pump.

The digging boom can be extended, raised or lowered, and moved sideways into nearly every conceivable position relative to the machine. It is raised and lowered by means of cables operated by worm gear that automatically locks it in any desired position so that a trench of constant level is dug. The buckets are made from a special steel alloy. The cutting teeth mounted on them have an action like that of a milling machine and the excavated material is delivered in small pieces, a detail that makes its packing in the trench easier when the time comes for it to be returned.

Shallow surface cuts and trenches 10 ft. deep can be made with equal facility, and the width of these cuts can be varied from 1 ft. 3½ in. to 3 ft. 6 in. Changes in the width of the trench can be made by fitting larger or smaller buckets, but "side cutters" can be used when a wider trench is to be cut than the buckets actually in use allow. These side cutters are specially designed fittings that resemble the two halves of a bucket. They are joined together by a thick steel bar, and are attached to the endless chain in the spaces between the buckets. Material dislodged by them falls into the bottom of the trench and is then lifted out by the buckets in the usual manner. The speed of digging of course is considerably reduced when side cutters are in use.

The endless chain carrying the buckets is built up of fork-shaped links and self-locking cotter-pins, and the entire assembly fits together without bolts or rivets. It is therefore an easy matter to repair any damaged section in a very short time, and work of this kind can be carried out without delay at the excavating site, a feature of vital importance, especially in contract work.

The material raised by the buckets falls on a sloping metal shield, from which it slides down a conveyor belt, the frame of which can be moved across the machine so as to allow the spoil to be deposited on the more convenient side of the trench for the purpose. When the machine is in transit the conveyor is moved into a central position.

Refloating Sunken Ships

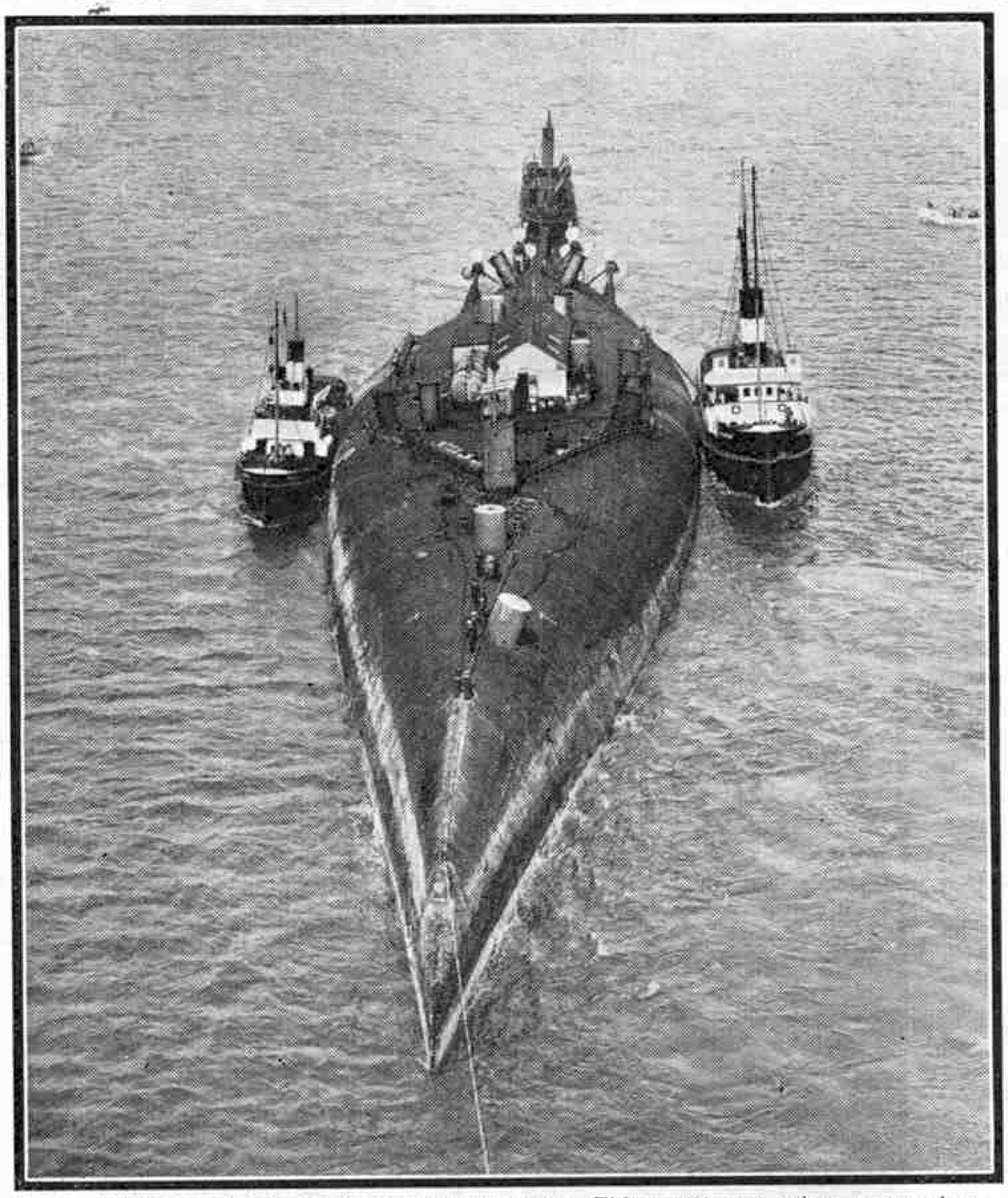
Marvels of Salvage at Scapa Flow

By W. A. Bagley

IN spite of modern invention, peril at sea is still considerable, and many wrecks occur every year. A ship may be fitted with all manner of safety devices, and be aided from the shore by lighthouses and radio beacons, but no ship-owner seeing his proud vessel steam away over the horizon can say with certainty that he will ever see her again. Storm and tempest may prove too much for the puny work of Man; a boiler may explode, or fire break out; or there may be a collision in the crowded approaches to a harbour, especially in foggy weather. An error of judgment on the part of those in command, or a defect in the compass or steering gear, may lead a vessel on to dangerous rocks, or cause it to collide with an iceberg. Indeed, our maritime history is literally strewn with great wrecks.

Some wrecks are never raised, owing to the possible trouble and expense incurred being out of all proportion to the anticipated rewards. Most of them are dealt with, however, usually with one of three purposes in view. The first is to float and repair them, if possible, in order to restore them to their proper places on the high seas. The second is to prevent them from becoming obstructions to navigation. This is particularly important when a wreck occurs in the fairways or approaches to a harbour, or in a river. Its position is then marked with a wreck ship or a buoy, and sometimes it is blown up, a wasteful and summary method to which no further reference need be made. The third reason for dealing with a wreck is that the ship is worth a good deal as scrap metal, even with the price of scrap iron so low as it is at present. A sunken battleship might be worth thousands of pounds, and its gun-metal tubes alone are likely to be worth £100 each.

Before the days of lighthouses, it used to be a common occurrence for the callous inhabitants of certain coastal hamlets to show false lights, and deliberately cause a wreck in the hope of gaining valuable loot. Nowadays it is illegal to loot a wreck. The Board of Trade looks after wrecks cast up on the shores of Great Britain, and appoints Receivers to take charge of them, and many shipowners subscribe to various salvaging societies, who look after their interests.



A salvaged German battleship on the way to Rosyth. This vessel was raised upside down. The photographs illustrating this article are reproduced by courtesy of Cox and Danks Ltd.

Most of the plant for wreck raising is carried aboard a salvage steamer. This is a small but complicated vessel, and generally is made of wood, so that she can remain alongside a wreck in rough weather and withstand the buffetting of the seas. Her complement of gear and equipment is very extensive, so as to render her as nearly as possible independent of shore assistance.

As can well be imagined, her pumps, of which she carries a large variety, capable of throwing out thousands of tons of water an hour, are among her most important features. The latest electrical pumps are portable, and can be slung from derricks, which often are of the floating variety. They are submersible, and can easily be transferred to the wreck. Oil driven pumps also are extensively used, and their fuel can conveniently be carried in an ordinary ship's lifeboat. Steam pumps have certain advantages, and formerly were much used. They are often still retained to-day, as they are useful for pumping away such cargoes as sand, coal, grain, and even copper or iron ores. Their drawbacks are many, however. For example, time is taken to raise steam for them, and once started this has to be maintained, even when the pump is not actually at work. It is difficult to transfer them to a wreck, especially in bad weather, and the necessary coal takes up valuable space and has sometimes been washed away.

Oil-driven air compressors that can pump air for days together are included in the salvage vessel's equipment, as well as an oxy-acetylene plant, the fiery flame of which creates such intense heat that it can cut steel plates and girders under water. There are also drilling machines, hammers, high-pressure hydraulic rock boring apparatus, submarine photographic gear, searchlights worked from the ship's dynamo, a radio plant and many other features. The crew of officers, men, divers, artisans and others number about 80.

There are several ways of raising wrecks, and the method or combination of methods employed obviously depends upon such considerations as the position of the ship, the extent of damage, the rise and fall of the tide, and the state of the weather. The whole aim of salvaging is to restore the buoyancy of the ship and so refloat it. The simplest case is where the ship has been driven ashore by storm, and is being beaten up by the waves. In such cases the ship must be securely moored and lightened as much as possible by having the cargo jettisoned, the leaks patched up, and the water pumped out of her. If all goes well, the next high tide will carry her off.

Many wrecks occur in deep water, however, and the vessels usually are not visible from the surface. One method of salvage utilises the rise and fall of the tide when this is sufficiently marked. A pair of barges, or perhaps pontoons, of sufficient buoyancy are placed over the wreck, and wire cables as thick as a man's leg are fastened to the bollards of one barge and led under the wreck to the other barge, where they are again fastened. As many as six cables may be used, and when this part of the work is finished the wrecked vessel lies in a steel cradle. This is done at low water, so that the barges rise with the tide and lift up the ship. The amount of lift of course is the same as that of the rise of the tide. Sea water is sometimes let into the barges at low tide so as to sink them as low as possible when passing the cables under the wreck. This water is afterwards pumped out, and thus extra lift is secured.

After the ship has been lifted off the bottom it is towed into shallower water, the wires are wound up to suit the new draught, and the process is repeated until the wreck has been raised sufficiently.

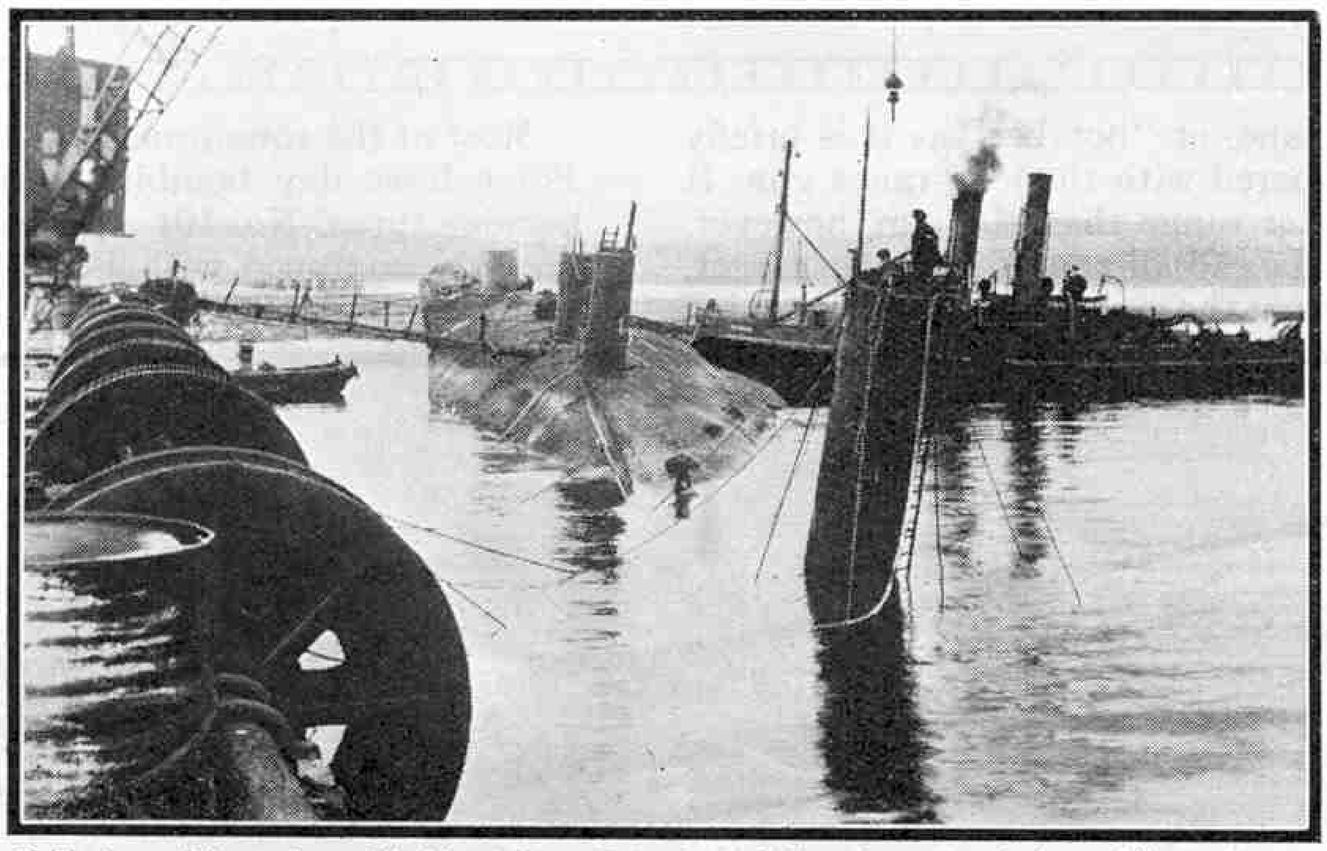
This sounds simple enough in theory, but in actual practice it is often far from being so. A wreck often is found to be deeply embedded in sand, and holes have to be bored beneath it, or the cables have to be laid down in a position where the wreck can be towed over them.

If there is no rise and fall of the tide a different method is necessary. Two well-fendered pontoons are then used. A cable is passed under the wreck and one end is fastened to the first pontoon, which is hauled down to one side of the wreck by means of a winch on the second pontoon. The latter is then filled with water, and allowed to

slide down the cable to the other side of the wreck, where it is fastened by means of a special grip operated from the surface. The water in the pontoons is then ejected, either by means of compressed air or by pumping. The wreck is thus buoyed up in exactly the same manner as a boy "swimming" with a pair of water-wings, and is raised to the surface.

When a wreck is lying upside down, compressed air is pumped into specially prepared compartments in it that are known as "air locks." This forces the water out through the lower openings, and pumping is continued until the volume of air thus trapped gives sufficient buoyancy to raise the wreck. The method is similar to that already described, but the air is held by the ship itself instead of the pontoons.

All hatchways, funnel openings, portholes, leaks, and other holes in the ship's structure of course must be sealed with a special cement or otherwise closed, in order to prevent the escape of the compressed air. The wreck also must be made strong enough to withstand the terrific pressure, and for this reason decks have to be strongly shored up and supported. It will be realised that this entails a considerable amount of arduous work by divers.



Raising one of the sunken battleships at Scapa Flow. On the left can be seen part of one of the pontoons, with the wheels over which passed the cables inserted under the wrecked vessels.

As the water is displaced, workmen enter the ship through a great iron shaft that is built up from the wreck, and stands out of the water like the top of a factory chimney. The shaft is fitted with a double air-tight trap door, so that the men can pass in and out of it without letting the compressed air escape. If such a calamity did occur, the water would surge in, and the men would be drowned like rats. Those engaged on work of this kind soon become accustomed to the atmosphere of compressed air, which acts like an invisible sheet of glass holding back the water.

The most famous of all salvaging exploits undoubtedly is the raising of the ships of the former German navy that were scuttled one bright midsummer morning in 1919 in Scapa Flow, the splendid natural harbour in the Orkney Islands. Without a single shot being fired, 72 ships, built at a cost of £40,000,000, went to the bottom as the sea cocks were removed. Their sinking was dramatic, but the struggle to raise them was even more thrilling. Most of the ships were raised between 1924 and 1931, and the *"Bayern,"* one of the remaining dreadnoughts, was brought to the surface early in 1934.

The beginning of the long task of salvaging the vessels came when Mr. E. F. Cox, of Cox and Danks Ltd., iron and steel merchants, shipbreakers and salvage contractors, walked into the Admiralty and boldly purchased the sunken battle cruisers and torpedo boats. Mr. Cox had previously bought two obsolete battleships for scrap, but this time the experts thought that he was attempting too much, and was throwing good money away. But he won through. It was a long job, in a bleak, lonely spot, almost out of touch with civilisation, that called for great moral courage as well as financial resources to the utmost. Mr. Cox spent more than £400,000 before his first ship was raised, and his wages bill was in the neighbourhood of £500 a week. In all he spent £450,000 to realise a profit of £10,000. Before he began, he had never salved a ship in his life. Now he is accounted one of the world's greatest experts on the subject.

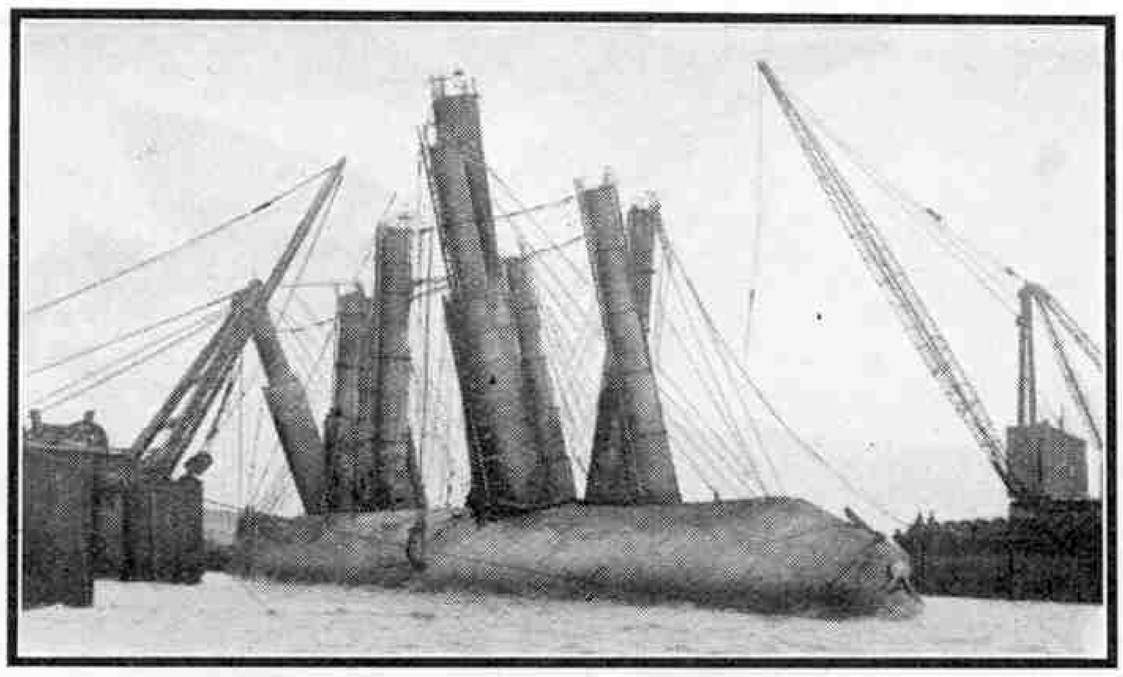
Most of the processes used in raising the wrecks were similar to those already described, but Mr. Cox and his men converted salvaging into a fine art. For example, a quicker method was devised of fixing a cable under a ship, a process normally taking a day or two. The first cable carried a guide rope for the second, the second carried a guide for the third, and so on. A record was achieved by passing one cable under a vessel in 40 min., and as many as 10 were placed in position in two days. An old floating dock cut in two furnished the necessary pontoons, and cables costing hundreds of pounds were used.

The crowning triumph was the salvaging of the *"Hindenburg,"* a battle cruiser of 28,000 tons. No ship of her gigantic size had ever been raised before, and not until after three fruitless efforts had been made, and over £50,000 had been spent, was the feat successfully accomplished. She was lying the right way up, but started to overturn when lifting began. To prevent this, a huge block of concrete weighing 50 tons was placed against one side. Then she started canting over to the other side, and work again was held up until a second block was added, at considerable expense, to balance her.

Danger and serious accidents threatened on all sides. For example, on one occasion a giant chain, on which a small fortune had been spent, snapped and sent its links flying in all directions. No one was killed on duty, however, owing to the great care exercised; and during operations diversions of a lighter kind were provided by sportive whales and seal pups that disported themselves around the divers' air pipes.

The *"Bayern,"* which carried 24 heavy guns, was one of the largest of the dreadnoughts. She was 630 ft. long and 100 ft. wide, and had a displacement of 28,000 tons. She was lifted by Metal Industries Ltd., Rosyth, who bought the plant at Scapa Flow from Cox and Danks Ltd. after they had given up the job. The ship was at a depth of 120 ft., or 25 ft. deeper than the previous ships; but whereas some of the vessels previously raised had lists of 18 deg. to 23 deg., the *"Bayern"* was upside down, nearly level, and had a list of only 9 deg. Salving her therefore was a somewhat easier proposition, but the word "easier" must be used with caution, for the task indeed was a stern one.

The seven airlocks that had to be inserted in the vessel were each 100 ft. in length, and thus were longer than any previously constructed. Two principal requirements always had to be borne in mind. One was that the airlocks had to be so placed that the ship would rise in a balanced position. In addition, it was necessary to make sure that the pressure in the locks would be adapted to a sudden rise from the bottom, where the air pressure had to be maintained at 50 lb. per sq. in., to the surface, where only 10 lb. per sq. in. was possible. The locks had to be kept from bursting, and at the same time maintained in condition to support the ship.



The air locks used in salvage work are seen in this photograph.

It was a terribly arduous task for the divers, one of whom died; but engineering skill triumphed in the end, and the giant was afloat again, with 18 ft. of freeboard.

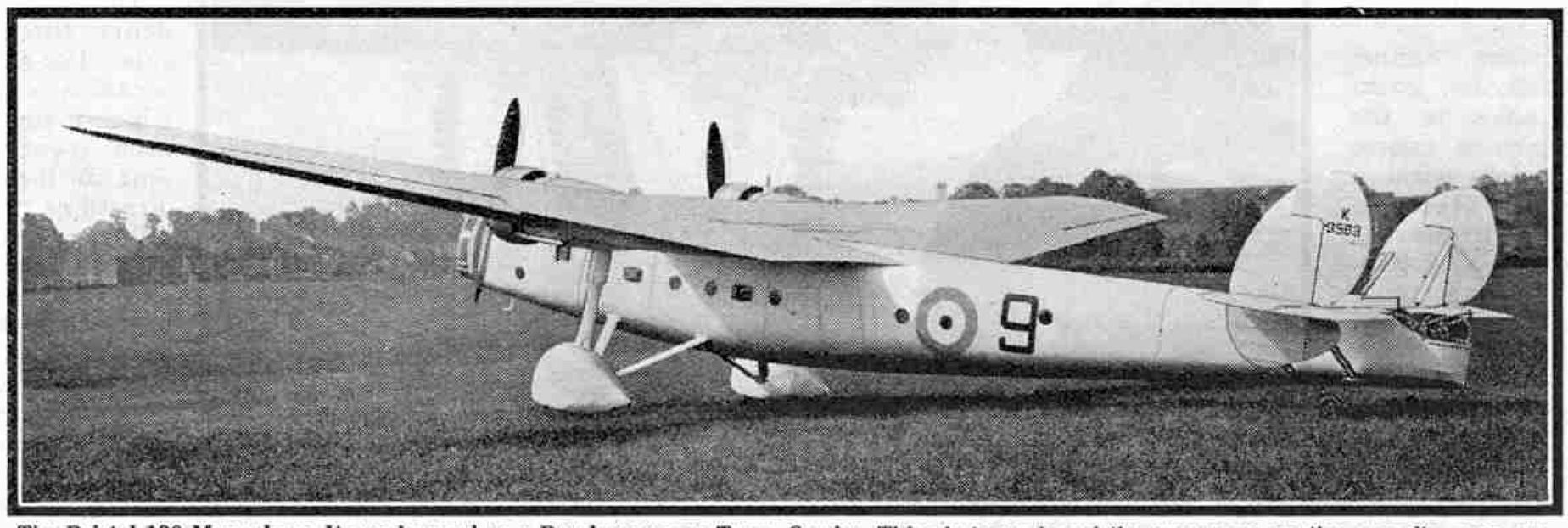
After their long immersion in the water, the raised ships presented a strange appearance. Searchlights, masts, and upper works generally were fantastically twisted, and marine growths of beautiful colouring and marking covered everything. Guns were festooned with long ribbons of seaweed, and shorter growths like grass grew everywhere. Spiny sea urchins, mussels, and baby oysters clung to the slimy plates, and offered a feast to the thousands of sea gulls that were attracted to the spot. Under a hot sun the growth soon decayed, however, giving rise to an intolerable stench.

The salvager is generally a hard-bitten practical man, who doubtless thinks chiefly of such matters as air pressure and the price of scrap iron. His divers raise treasure from the bed of the sea in the form of rusty iron plates, and not romantic "pieces of eight," and they display great pluck and endurance in carrying out their arduous work under water.

British Military Aircraft

Modern Bombers and Troop-Carriers

THE bombing aeroplane, or "bomber" as it is briefly called, may be compared with the long-range gun. It has an immensely greater range than the gun, however, and the bomb is discharged directly over the target, whereas the projectile from the gun covers the intervening miles after it has been discharged. Long-range bombing aeroplanes are very large, and are able to fly great distances without refuelling, and to maintain a high speed for long periods, an invaluable factor when they are pursued by enemy defence squadrons. When not employed on bombing expeditions some of them can be adapted to serve as troop-carriers, to transport freight and equipment, or to assist in evacuating besieged civilians. Such aeroplanes are called bomber transports.

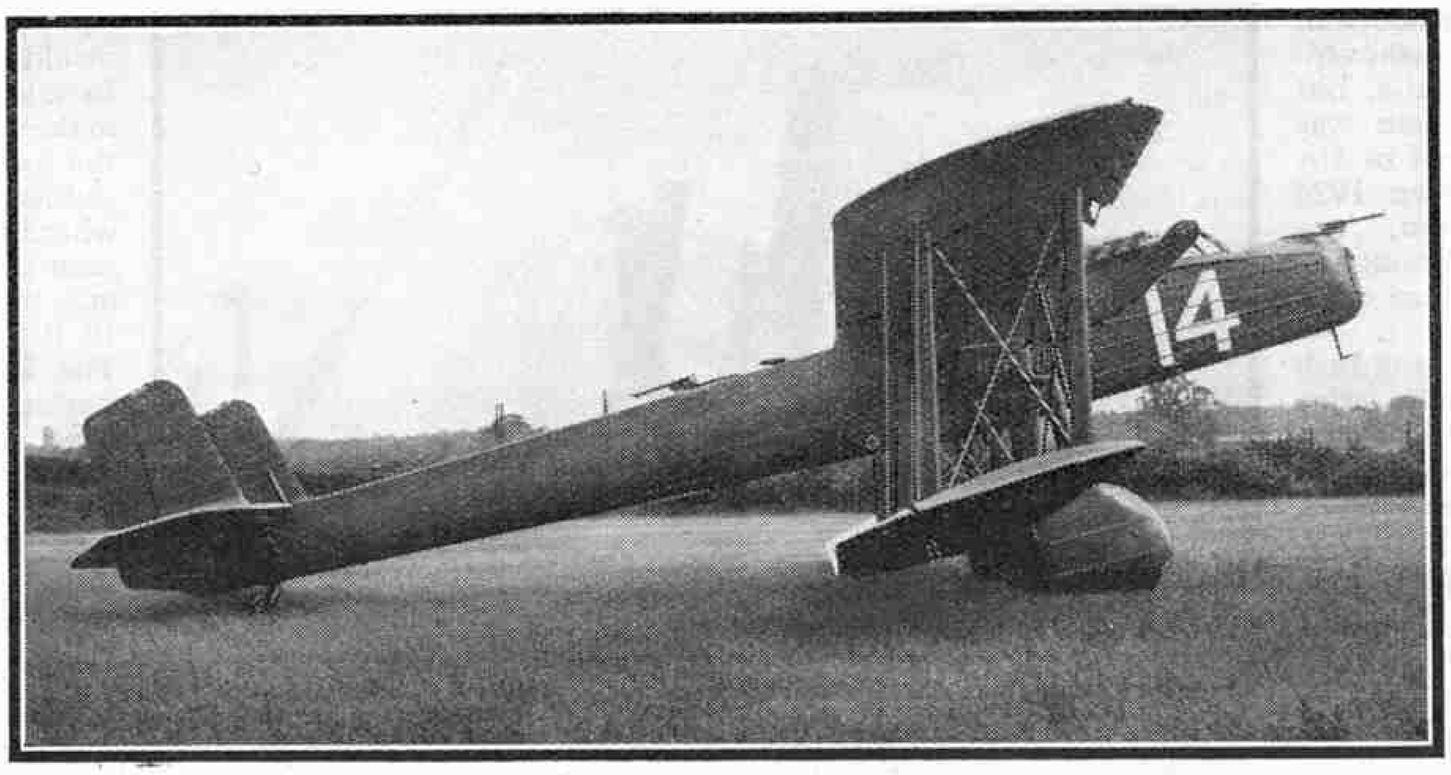


The Bristol 130 Monoplane. It can be used as a Bomber or as a Troop-Carrier. This photograph and the upper one on the opposite page are reproduced by courtesy of the Bristol Aeroplane Co. Ltd., Filton.

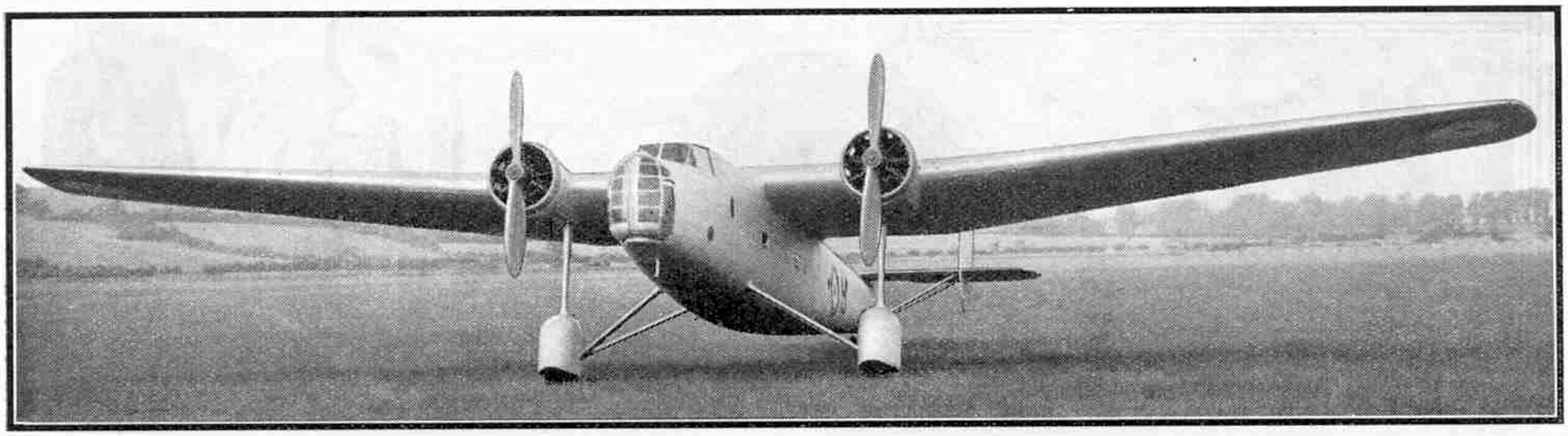
The Bristol 130 aeroplane illustrated here is a typical example of the latest type of bomber transport. As a bomber it carries a crew of four and a heavy load of bombs, and when used for the transport of troops it carries a crew of three and 24 fully armed men. It has not yet been supplied to the R.A.F., and very few details are available. The illustrations show it to be a twin-engined high wing monoplane. The wing span is 96 ft., the length 67 ft. 9 in., and the height 16 ft. Hydraulically-operated flaps are fitted to the trailing edges of the wings. The two engines are Bristol "Pegasus III.M3s," mounted one on each side of the fuselage in nacelles faired into the wings. There are two guns in the aeroplane. One gun is in an enclosed turret in the nose, and fires through a vertical slit in the front of the turret. This slit can be closed by a patent fastener when the gun is not in use. The other gun is in an open position at the extreme stern of the fuselage.

Most of the squadrons of the R.A.F. and Auxiliary Air Force have day bombing aeroplanes, and these are of various types. No. 101 squadron, for instance, was until recently equipped with Boulton Paul "Sidestrand" day bombers, but these have been replaced by Boulton Paul "Overstrands." This twin-engined bomber is shown in the lower illustration on the next page. It is a development of the "Sidestrand," and in general design and layout the two machines are very similar. Many important improvements have been effected in the new type, however, including a general stiffening-up of the structure to enable the aeroplane to carry much greater loads and at the same time achieve an increased performance, better protection for the pilot and the two gunners, and provision for warming the cockpit.

The outstanding feature of the "Overstrand," however, is the totally enclosed turret provided for the forward gunner and built in the nose. A detailed description of the turret is not allowed, but it may be mentioned that it gives the gunner complete protection from the weather, and being mechanically rotated it enables him to work his gun much more easily and accurately than would be possible in an open cockpit. In the latter case the great air pressure on the exposed gun when the aeroplane is flying at a high speed makes it extremely difficult for the gunner to carry out the rapid readjustments of aim that are necessary to maintain accurate fire. The gun in the turret is so perfectly balanced that it can be directed upward or downward easily and swiftly. The turret serves also as a bomb-aiming position. The second or rear gunner occupies a cockpit just behind the wings, fitted with an improved

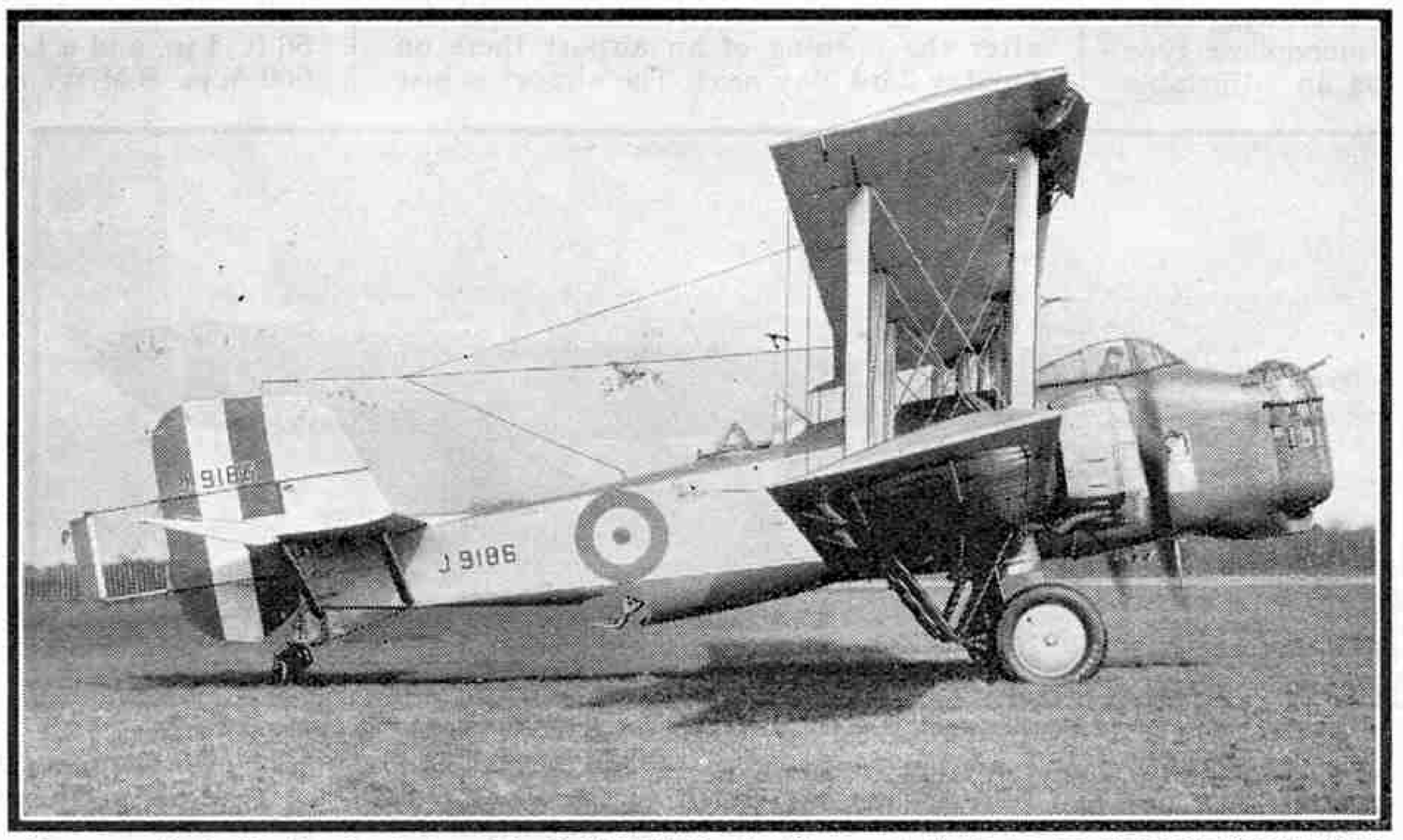


This formidable-looking aeroplane is the Handley Page "Heyford" Express Bomber. A rotatory gun turret inside the fuselage can be lowered in the event of attack from below. Photograph reproduced by courtesy of "Flight."



type of windscreen to protect him from the slipstream. In the event of the aeroplane being attacked from below he would be at a disadvantage, and there is therefore a gun specially mounted on the underside of the fuselage for use in warding off attack from below.

The "Overstrand" has a span of 72 ft., a length of 46 ft. 2 in., and a height of 15 ft. 9 in. Both upper and lower wings have ailerons, and the upper one has also Handley Page automatic slots. The undercarriage is of the divided type, one half being on each side of the fuselage and attached to the underside of the engine casings. The pilot's cockpit is between the gun turret and the wings and is totally enclosed, but it has a sliding roof. This cockpit and that of the rear gunner can be warmed by means of a new and efficient type of air heater fitted to the engine exhausts. This maintains a comfortable temperature in the cockpits however cold the outside air may be. Bristol "Pegasus II" supercharged engines are used, and they enable the aeroplane to attain a top speed of 153 m.p.h. at 6,500 ft. It can take off in 200 yd. and has a service ceiling of 22,500 ft.



The upper illustration is a front view of the Bristol 130 Bomber Transport. The lower one shows the Boulton Paul "Overstrand" Day Bomber. The mechanically-operated turret in the nose should be noted. This photograph is reproduced by courtesy of Boulton Paul Aircraft Ltd., Norwich.

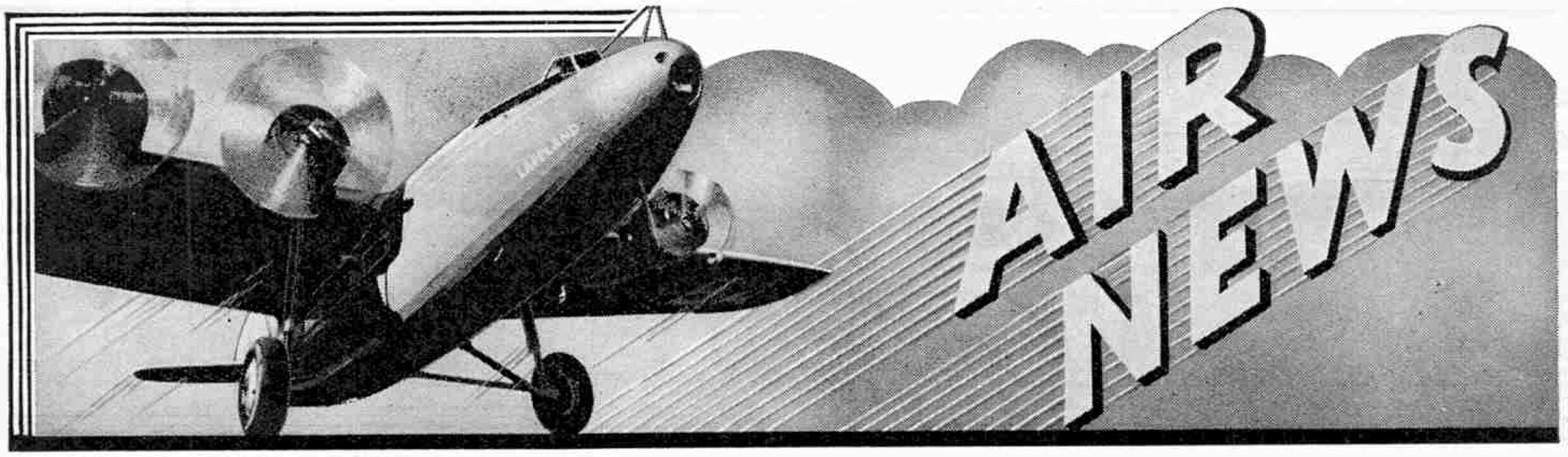
Certain types of bombing aeroplanes are designed for use either by day or by night, and these are generally referred to as night bombers, to distinguish them from others intended for use only during the day. The night bombers in the R.A.F. carry a crew of at least five, and are of several types. One of the new squadrons formed under the present expansion scheme has been equipped with the latest type of Handley Page "Heyford" night bomber shown in the lower illustration on the previous page.

In both this and the earlier "Heyford" there are three cockpits. The first is a large one in the nose and is occupied by the navigator and a gunner who also acts as bomb-aimer. The second or pilot's cockpit is behind it, but far enough forward to be in front of the airscrews; and by its elevated position gives the pilot a good view in all directions. The third one, for the rear gunner, is behind the wings. There is also a screened and rotatory turret that is lowered through the underside of the fuselage when the aeroplane has to be defended from attack from below. In the event of such an attack the rear gunner may work the turret gun and the wireless operator give a hand by working the gun in the rear cockpit. Normally the wireless operator occupies a position within the fuselage, almost beneath the pilot's cockpit.

The "Heyford" illustrated differs in several important respects from the earlier version. The large cockpit occupied by the navigator and bomb-aimer has been altered to give a better outlook and more protection. The pilot's cockpit is now totally enclosed, and a new arrangement of the windscreen enables him to look out of the side windows and glance upward or downward without difficulty, no matter how fast the aeroplane may be flying. There is an automatic pilot installation, and an aerial camera can be fitted close to the wireless equipment. The rear gunner's cockpit has been modified, the top of the fuselage having been built up at the forward part and arranged so that the sides drop away by the gun position. By this arrangement the gunner is well screened and is helped to obtain accuracy of fire.

A heavy load of bombs of various sizes can be carried, and they are attached to racks in the thickened centre section of the lower wing. The bombs and racks are in a series of compartments each closed by a spring door. When the objective is reached the bombs are fused and fired by patent Handley Page gear.

The wings are of 75 ft. span and are made in three sections, and the centre section of the upper wing rests on the fuselage. They are of metal and are covered with fabric; both have ailerons, and the upper one has automatic slots. The fuselage is a long rectangular metal structure with a covering of aluminium sheeting. The undercarriage wheels are almost hidden by large fairings that extend upward and join the centre section of the lower wing. Rolls–Royce "Kestrel VI" engines are employed.



The Potez 54

The Potez 54 illustrated on this page is a twin-engined military aeroplane of the high wing monoplane type. It has a span of 72 ft. 6 in. and a length of 53 ft. 2 in. The wings are of metal covered with fabric, and each is built in two sections, which are attached to the fuselage and braced by struts and wires to the engine nacelles. The fuselage is of wood, but a metal bulkhead is incorporated behind the seat provided for the first pilot, and forms an anchorage for the front wing spars and bracing members. A monoplane type tail unit is fitted, and has an adjustable tail-plane. The undercarriage is in two separate units, and when the machine is in flight is retracted hydraulically by a rotary pump driven off the right-hand engine. At the end of a flight it is lowered by means of a hand pump.

The various cockpits are totally enclosed. The first one, in the nose, is occupied by a gunner, and below him sits the chief officer, adjacent to the bomb sights and releases. A large cockpit immediately in front of the wings accommodates two pilots seated one behind the other, and behind the wings is one occupied by a second gunner. This cockpit has guns both above and below the fuselage.

When used as a bomber the machine carries about 2,000 lb. of bombs. It is also adaptable for reconnaissance work, and is then equipped with photographic apparatus instead of bombs.

The standard engines fitted in the Potez 54 are 550 h.p. Hispano-Suizas and they give it a top speed of 192.5 m.p.h. at 13,120 ft. Alternatively Gnôme-Rhône 14Kdr or Lorraine "Petrel" engines can be installed, and in these cases the top speeds at the height already given are 208 m.p.h. and 192.5 m.p.h. respectively.

The Potez 54 twin-engined Fighter described on this page. Photograph by courtesy of Aéroplanes Henry Potez, Paris.

British Air Services to Scandinavia

There will be three regular British air services between this country and Scandinavia this summer, and two of them are already in operation. These are the services of British Continental Airways Ltd., and of British Airways Ltd. The last mentioned has attracted the most attention, as apart from the services of Imperial Airways, it is the first British air line to be granted a Government subsidy. British Airways Ltd. was formed early this year by the amalgamation of Hillman's Airways with the Spartan and United Air Lines.

The route of the new services is from Croydon to Amsterdam, Hamburg, Copenhagen and Malmö, a total distance of about 700 miles. It is being flown once daily in each direction, and the journey takes only about seven hrs., being one of the fastest in Europe. D.H.86s are used, but later they will be replaced by D.H.86A Express air liners.

Another development will be the extension of the services to Stockholm after the opening of an airport there on Sunday 23rd May next. The airport is just over four miles out of the town, and although not the largest in Europe it will certainly become the most important in Scandinavia. Paved runways 2,265 ft. long and 164 ft. wide have been laid down. The airport buildings include Customs Offices, a meteorological station and a wireless station. It is equipped with every modern facility for night flying, and the floodlighting and boundary lighting is very extensive. There are also special lights to indicate the situation of the runways.

Modernising the U.S. Air Force

Some big contracts are being placed by the U.S. War Department for new aircraft. Naturally very few details are available about the various types of aircraft concerned. One of the contracts, for 100 military aeroplanes and spare parts, has been given to the Northrop Corporation, of Inglewood, California. These aeroplanes will carry four machine guns, including a special machine gun in the rear cockpit, and 20 small bombs. Sufficient fuel will be carried for a flight, at cruising speed, lasting 8 hrs. They will have Pratt and Whitney engines of 750 h.p., and it is understood that these will give a top speed of 250 m.p.h.

New Heinkel Monoplane

A new high speed twin-engined monoplane has been produced by the Heinkel Company, in Germany. It is a development of their well-known He.70 monoplane, a type that has done good work on the Stuttgart-Seville section of the South Atlantic service operated by Deutsche Luft Hansa, and it is not surprising, therefore, that the D.L.H. are interested in the new product.

The machine is a low wing aeroplane with a span of 74 ft. 1 in., a length of 56 ft. 1 in. and a height of 12 ft. 6 in. Two 660 h.p. B.M.W. engines are fitted, and these give it a top speed of 214.37 m.p.h. and a cruising speed of 186.41 m.p.h. Both the undercarriage and the tail wheel are retracted when the aeroplane is in flight, and the legs of the undercarriage are then drawn up into recesses provided for them in the underside of the engine nacelles. There is a freight compartment in the nose of the fuselage and behind it is the pilot's cockpit. The passengers' cabin, to the rear of the cockpit, is arranged in two compartments and the front one is intended for use as a "smoker."

"Dragon Rapides" for Spain

The Spanish Air Force have taken delivery of three D.H. "Dragon Rapides" adapted for military use, and these are now in service in Spanish Morocco. The "Dragon Rapide" is a high wing monoplane with two D.H. "Gipsy Six" engines, each of 200 h.p., and cruises at 130 m.p.h. It climbs at the rate of 900 ft. per min. and carries sufficient fuel for a non-stop flight lasting 4½ hrs.

The military type of the "Dragon Rapide" is practically a "general purpose" aeroplane, as it can easily and quickly be made suitable for use as a small troop-carrier, a light-bomber or an ambulance, or adapted for reconnaissance duties. When equipped as an ambulance four stretchers are mounted in the cabin. It is armed with three machine guns, one being mounted in the pilot's cockpit and firing forward, another aft of the wings and firing backward, and the third placed so as to fire downward through the floor of the fuselage, where there is also provision for bomb dropping. The bombs carried each weigh 27 lb. and total 12.

Imperial Airways Notes

The steady growth of freight transport by air is shown by the fact that during a recent period of 12 months the air liners of Imperial Airways carried 1,778,726 lb. of urgent freight, a figure much greater than any recorded during a previous similar period. One of the most noticeable things about air transport at the present time is the increasing volume of freight that is being taken by air between London and the Continent and from England to destinations along the Empire routes.

The chief reason for this undoubtedly is the great saving in time that is achieved by this method of travel. Goods sent from London to Paris complete their journey in 3¾ hrs. by air route, as compared with 9 hrs. by surface transport, while to Cologne the 3½ hrs. by air contrasts with 12 hrs. by land and sea. On the Empire air services the time-savings are much more striking. Urgent freight consignments by air from London to Alexandria reach that city in 3 days, as compared with 9 days by surface transport, and from London to Karachi a freight transport surface time of 22 days can be reduced by air to 5 days. Capetown is now within 9 days of London by air freight dispatch, as compared with 18 days by surface routes, while to Brisbane, Australia, an air goods time of 12½ days compares with 42 days by land and sea.

Another reason is that goods despatched abroad by air obtain a more rapid Customs clearance than if sent by boat and rail. Fragile articles can be exported with the minimum of packing, and this partly accounts for the large consignments of wireless valves forwarded by air from London to points along the Continental air routes. The valves travel safely in ordinary cardboard containers instead of having to be packed in the special wooden crates necessary when transporting them by land and sea.

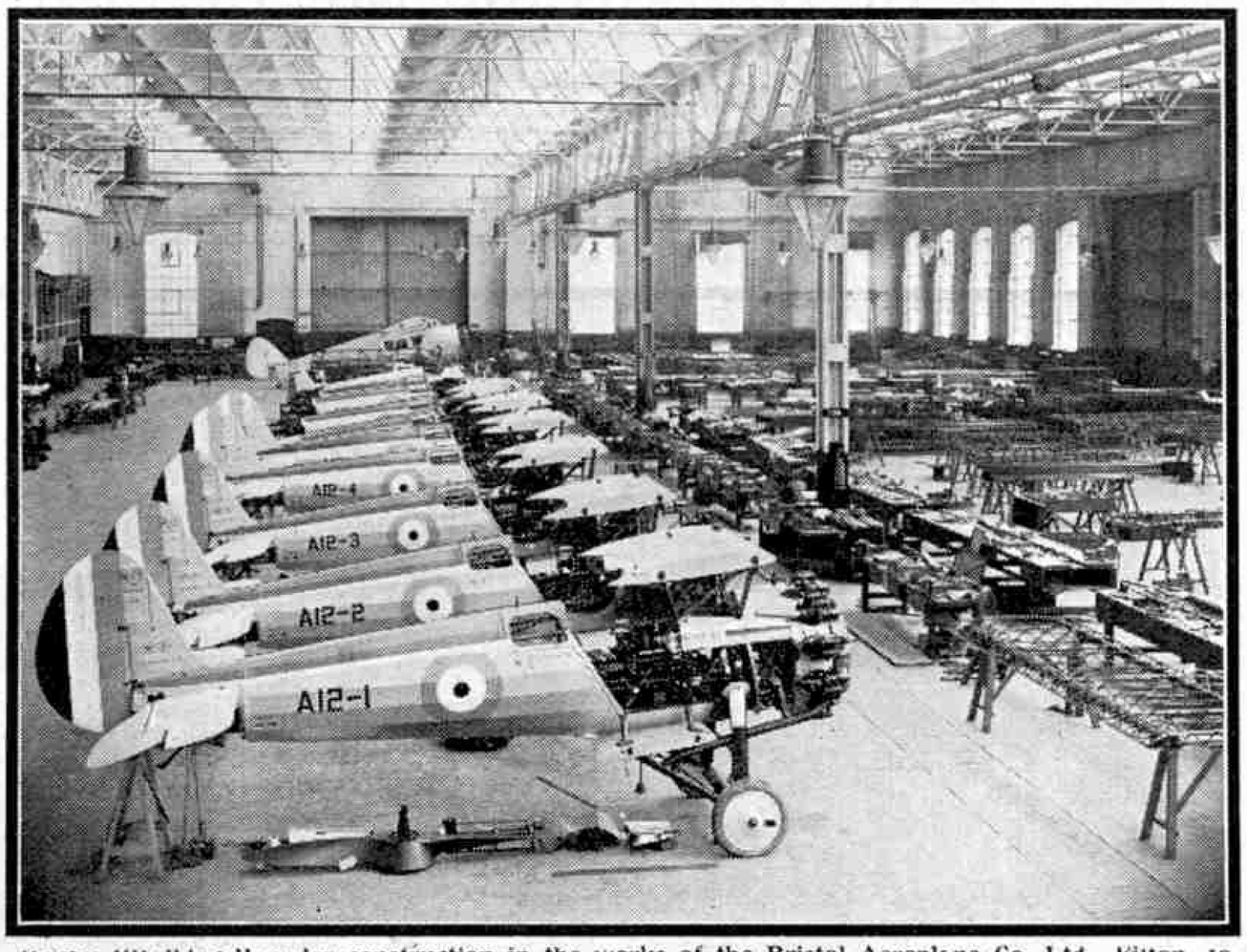
More New Air Liners for Sabena

The Sabena Company, of Brussels, continue to increase their fleet of aircraft and to show a preference for the Savoia-Marchetti S.73. Recently four more of these machines have been ordered from the Savoia Company, of Milan, and when delivered they will be used on the Sabena service to Madagascar. This service is operated jointly with Air Afrique.

The S.73 is an 18-seater air liner, and has three 700 h.p. Piaggio "Stella IX.R.C." engines, which give it a cruising speed of 174 m.p.h. The passengers cabins are warmed by liquid heating, so that no fumes from the engine exhaust are drawn into them, and the required temperature is thermostatically maintained

Mr. Ford's New Venture

The U.S. Department of Commerce has granted Mr. Henry Ford, the famous motor car manufacturer, an experimental licence for a new light aeroplane. The aeroplane is said to be fitted with a newly developed type of engine, and has dual control. Two passengers and 60 lb. of luggage can be carried.



Bristol "Bulldogs" under construction in the works of the Bristol Aeroplane Co. Ltd., Filton, to whom we are indebted for the illustration.

The First Flight at Night

Now that regular night air services are in operation, it is interesting to recall that the first experimental night flight was made just over 25 years ago by Robert Grandseigne, a French airman who had recently helped to build the monoplane in which Bleriot accomplished the first flight across the English Channel. At 2.30 a.m. on 11th February 1911, Grandseigne took off from an aerodrome at Issy-les-Moulineaux. He flew to Paris and circled over the sleeping city for about an hour before returning to the aerodrome. The aeroplane he used was an early type of Caudron biplane.

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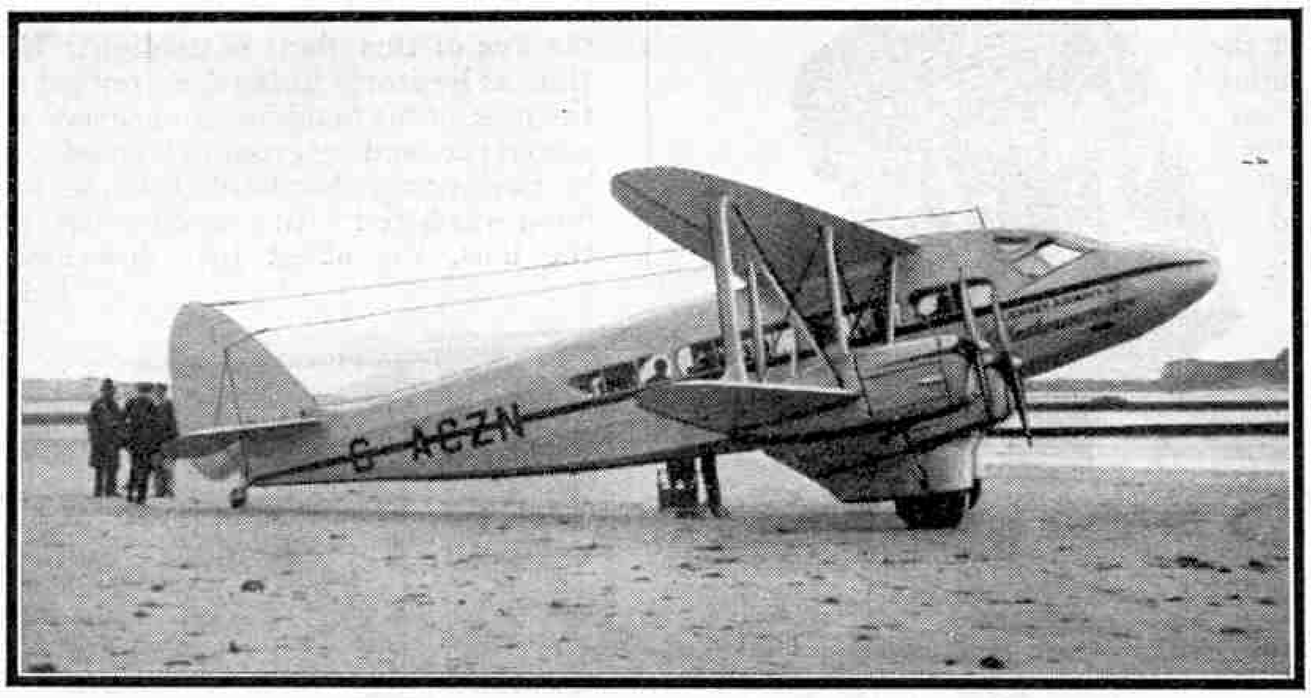
One of the Heinkel He.70 monoplanes operating the Seville-Stuttgart section of the D.L.H. mail service to South America recently achieved an average speed of 215 m.p.h.



The D.H. 86 "St. Catherine's Bay," on the sands at West Park, Jersey. It is one of the aeroplanes of Jersey Airways Ltd. Photograph by H. A. Breton.

Civil Aviation in the I.F.S. in 1935

In the Irish Free State privately-owned aeroplanes have to be registered with the Department of Industries and Commerce, and the number on the books of the Department at the end of last year was 29.

Kildonan Aerodrome at Finglas, formerly the headquarters of Everson Flying Services, was taken over early in the year by a new concern, Dublin Air Ferries Ltd., that began operations in March. The machines of this company were kept busy on private charter flights, and during the nine months to the end of the year they put in over 600 hrs. on this work.

King's Cup Air Race

The King's Cup Air Race is one of the most popular annual air events in this country. This year it will be held on 10th and 11th July, two months earlier than last year. It is again being organised by the Royal Aero Club.

The eliminating contest on the first day will consist of a flight over a set course totalling 1,240 miles; this is 287 miles longer than the course flown in 1935. The final, to be flown on the second day of the race, will again start and finish at Hatfield aerodrome, and will consist of several successive flights over a course about 50 miles in length.

There will be a change in the classification of the entrants, and in addition to the usual two classes for aeroplanes with engines of under and over 150 b.h.p., there is to be a third one for multi-engined aeroplanes, irrespective of the outputs of their power units.

Important Indian Air Race

The air race round India for the Viceroy's Challenge Trophy, in February last, was won by an Indian competitor, Lieut. Misri Chand, of the 14th Punjab Regiment. Flying a D.H. "Puss Moth," he covered the two-day course of 1,520 miles at an average speed of 116.5 m.p.h. Another Indian, Mr. C. V. Gadgil, of the Karachi Aero Club, was second, with a D.H. "Moth." There were 11 competitors, and nine of them completed the race. The finish was watched by Lord Willingdon, Viceroy of India, who afterward presented the trophy to the winner.

The race was organised by the Aero Club of India and Burma.

New R.A.F. Aerodrome at Singapore

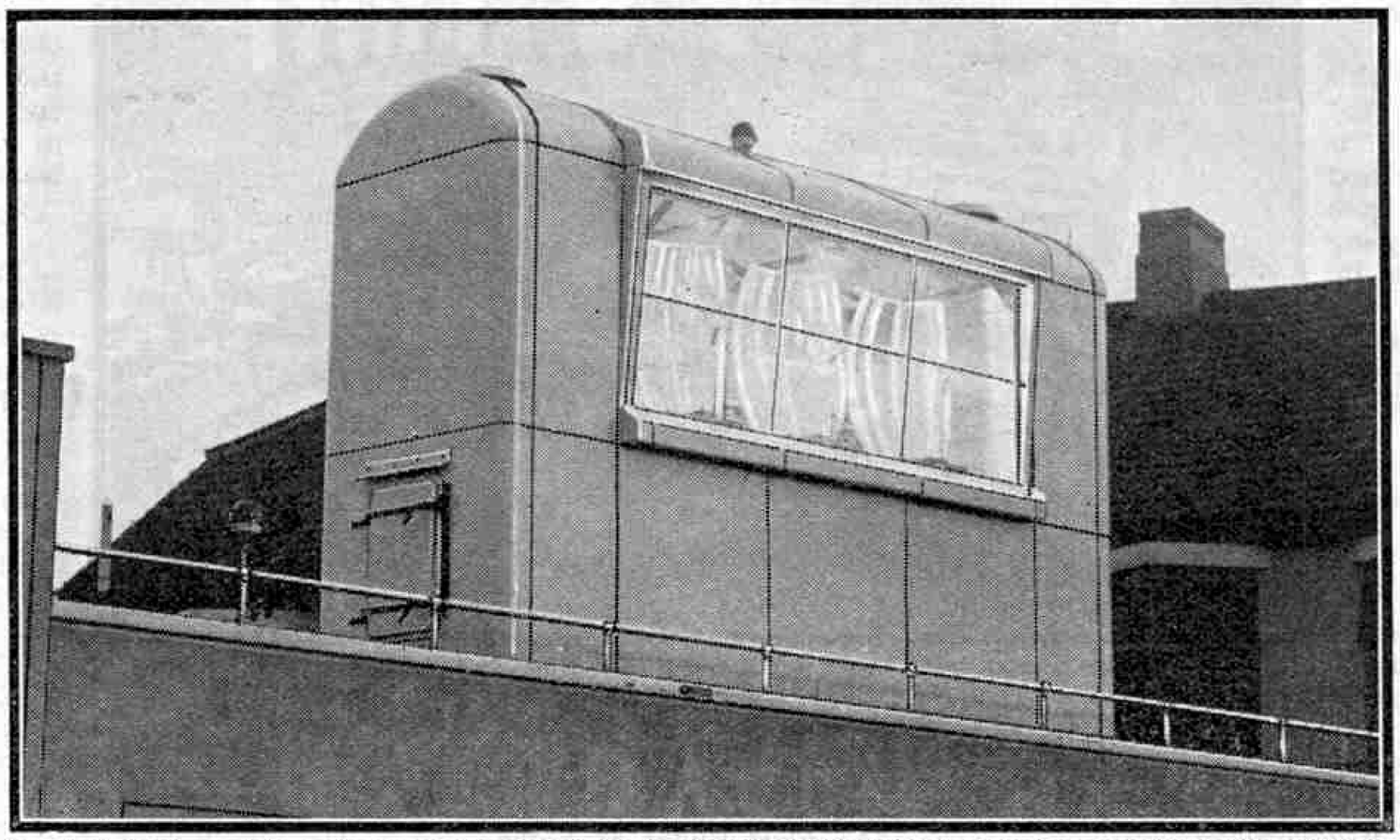
At present there are three squadrons of the R.A.F. at Singapore, the headquarters of the Far East Command. The R.A.F. strength there is to be increased shortly, however, and a third aerodrome is being constructed to provide the necessary extra accommodation.

Guiding The Night Pilot

Marvels of Aerodrome Mechanism

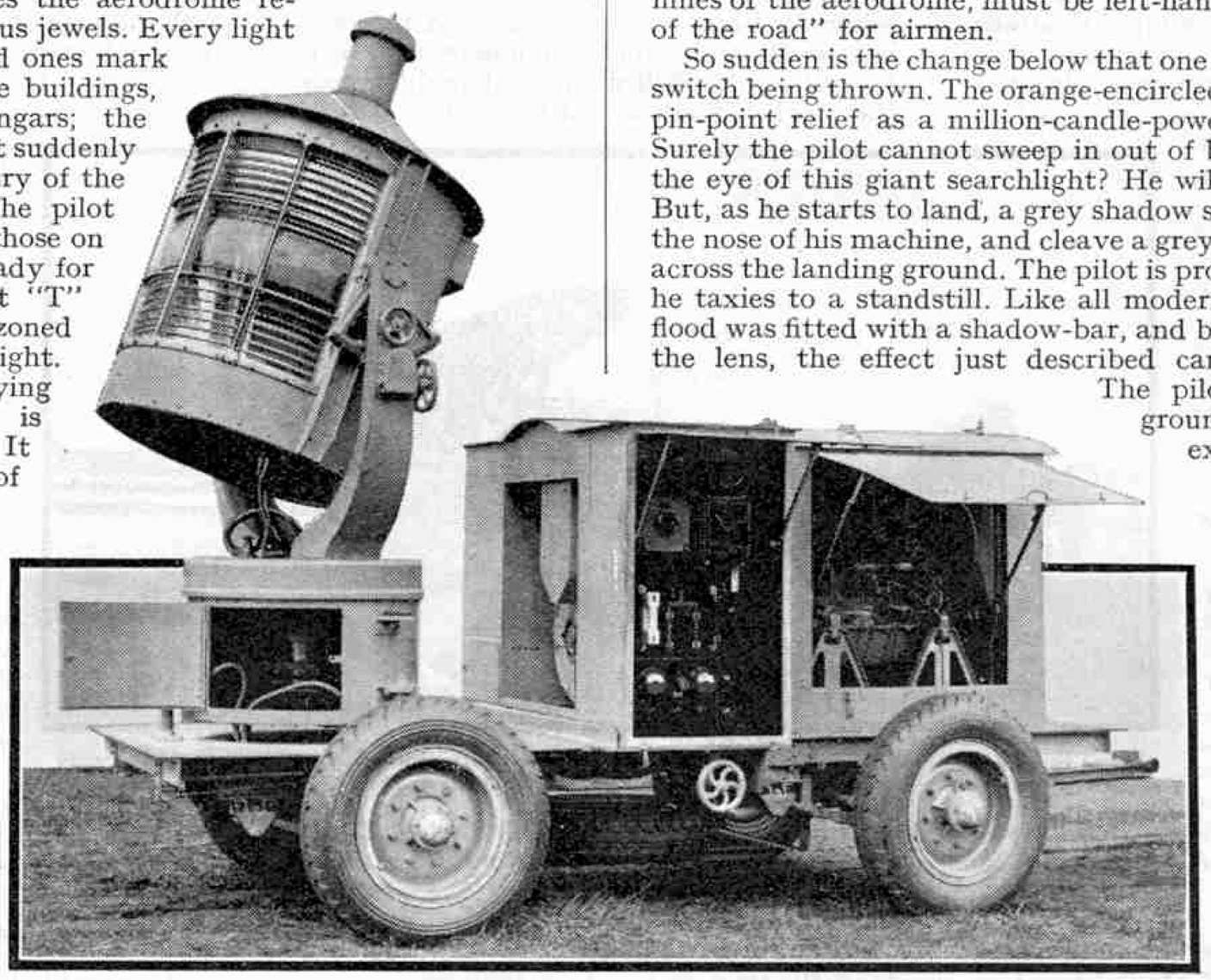
By J. Carmichael Johns

"WINDING in . . . . winding in . . . ." Nerves tighten in the control tower every time this message comes over the aerodrome's wireless. It means that outside, ten miles away in the darkness, a pilot is pulling up his trailing copper aerial. Soon he will be flying through the night unaided by any friendly voice in his earphones, for his wireless receiver is dumb without its aerial. Perhaps the control tower of the aerodrome he is heading for has been giving him quiet, concise instructions for the last hour. "Winging in . . . ." He sends out a final warning, and a second later the aerial is coiled up on its drum. The pilot glances from his instruments towards the airport; the responsibility of a safe landing now rests as much with the ground staff as it does with him.



The 1,250,000 c.p. "Chance" reflector floodlight on the roof of the traffic office at Heston Airport. The illustrations on this page and the lower one on the opposite page are by courtesy of Chance Brothers and Co. Ltd.

A mass of lights makes the aerodrome resemble a cluster of luminous jewels. Every light means something. The red ones mark obstructions such as office buildings, wireless masts, and hangars; the brilliant orange lamps that suddenly flash on mark the boundary of the landing ground. When the pilot sees them he knows that those on the ground are getting ready for him to come in. A giant "T" appears, apparently blazoned on the ground in white light. Actually it is a frame carrying electric light bulbs, and is mounted on a low mast. It indicates the direction of the wind. A pilot must land along the down stroke, pointing his machine towards the cross-head, as if the letter were an arrow. If the wind is blowing under four miles per hour, there is officially "no wind," and the "T" is set according to orders from the control tower. Before the pilot comes in the location beacon must be switched off, otherwise this lighthouse for airmen would dazzle him as it flashed out its welcoming beams.



"Chance" Mobile Floodlight-Beacon at Lympne. An advantage of this type of Beacon is that it can be hauled into the best position for guiding an aeroplane about to land.

Meanwhile, on the ground, loudspeakers announce in offices, hangars, and on the tarmac, that aircraft number "Y," pilot number "Z," ex-"Everytown," is about to arrive. This pilot, using a Morse lamp, has signalled the first and last letters of his registration number; now he is anxiously awaiting the control tower's O.K. If all is clear, his code message will be repeated by a green lamp, and his accustomed eye will quickly pick up the vital message. Sometimes, however, the signal is flashed back in red, and this means that he must not come down. Perhaps another machine is waiting to take off, or there may be half a dozen reasons why he must stay aloft. Should his petrol be running short, or any emergency make landing imperative, he sends an "S.O.S." by alternately switching on and off his navigation lights. Those on the ground know well what that means, and hastily do the best they can to clear the aerodrome.

When the pilot has received the O.K., he makes one more circle before coming in. His turns, like every manœuvre within three miles of the aerodrome, must be left-handed. This is a strict "Rule of the road" for airmen.

So sudden is the change below that one almost hears the floodlight switch being thrown. The orange-encircled landing ground leaps into pin-point relief as a million-candle-power lamp is focussed on it. Surely the pilot cannot sweep in out of blackness straight towards the eye of this giant searchlight? He will be blinded by the glare. But, as he starts to land, a grey shadow seems to project itself from the nose of his machine, and cleave a grey path in front of him, right across the landing ground. The pilot is protected from the light until he taxies to a standstill. Like all modern equipment, this landing flood was fitted with a shadow-bar, and by operating this in front of the lens, the effect just described can always be produced.

The pilot is now safely on the ground, so we can leave him and examine the system that made it all look so easy.

The ground floodlight, which we have just seen in action, is a wonderful piece of apparatus. It needs to be, for, next to the radio installation, it is the most important part of any aerodrome's night equipment. Somewhere on the control tower we shall find it mounted, a massive lantern-like structure fitted with a great semi-circular lens. If it is ultra-modern it may have a series of lenses. It floodlights every inch of the area where a machine may land, and throws the boundary fence into sharp relief. Light from the 10 kW lamp is concentrated into a wide fan, and projected almost parallel with the ground. No light is lost on the sky, for accurately set prisms in the top of the lens reflect the whole beam

downward. This also intensifies the light to fifty times its original candle power.

The shadow-bar previously mentioned makes it possible to point the floodlight directly towards an in-coming machine without any risk of dazzling the pilot. Before this came into use, the lamp's position had to be changed so that it shone from behind the pilot as he landed. For this purpose it was usually mounted on a petrol - electric generator and towed by a tractor. Such types are often used to-day in certain circumstances.

Details of individual aerodromes differ of course according to a multitude of factors. We have been considering an average modern one. This difference in arrangements is particularly marked in connection with the type of location beacon employed. The object of a location beacon is to form a lighthouse for airmen, but its working must be adapted to suit local conditions. To take two extremes—the beacon at Heston is simply a powerful red neon light projector; that at Johannesburg aerodrome is a revolving lighthouse of nearly a million candle-power, which has been picked out by airmen 100 miles away. There is some very clever work in this Johannesburg beacon; for instance, if one of the many bulbs composing the lighting unit gives out, another is automatically fitted in its place. Some units are designed to act both as floodlight and location beacons, and these are particularly useful in emergencies, or on smaller aerodromes.

A D.H.86 Express Air Liner floodlit by the landing lights of an airport.

Most beacons have a definite frequency of flashes per minute, so that they are easily recognisable by pilots. Thus, apart from serving their own particular aerodromes, they form valuable landmarks for passing aircraft.

There is not space for anything but the briefest description of the control tower, the nerve centre of every aerodrome. One might call the officer in charge an aerial traffic policeman. His responsibilities become much heavier at night. He is in constant telephonic communication with the airport offices and ground staff, and—through the wireless operator—with all incoming machines. It is he who issues the orders giving or withholding permission for a pilot to come down. He sets the wind indicator "T," and sees to the operation of the shadow-bar. At a moment's notice, day or night, he can wireless a pilot the exact position of his machine in relation to the airport, or local landmarks; or he can tell him the weather conditions for any particular zone. Very often, if the airport is of any size, it has its own meteorological station.

The tower is usually surmounted by the location beacon and, apart from the controls just mentioned, contains switches that operate the main lighting systems. It occupies the most prominent position on the aerodrome, and commands an unobscured view of the sky.

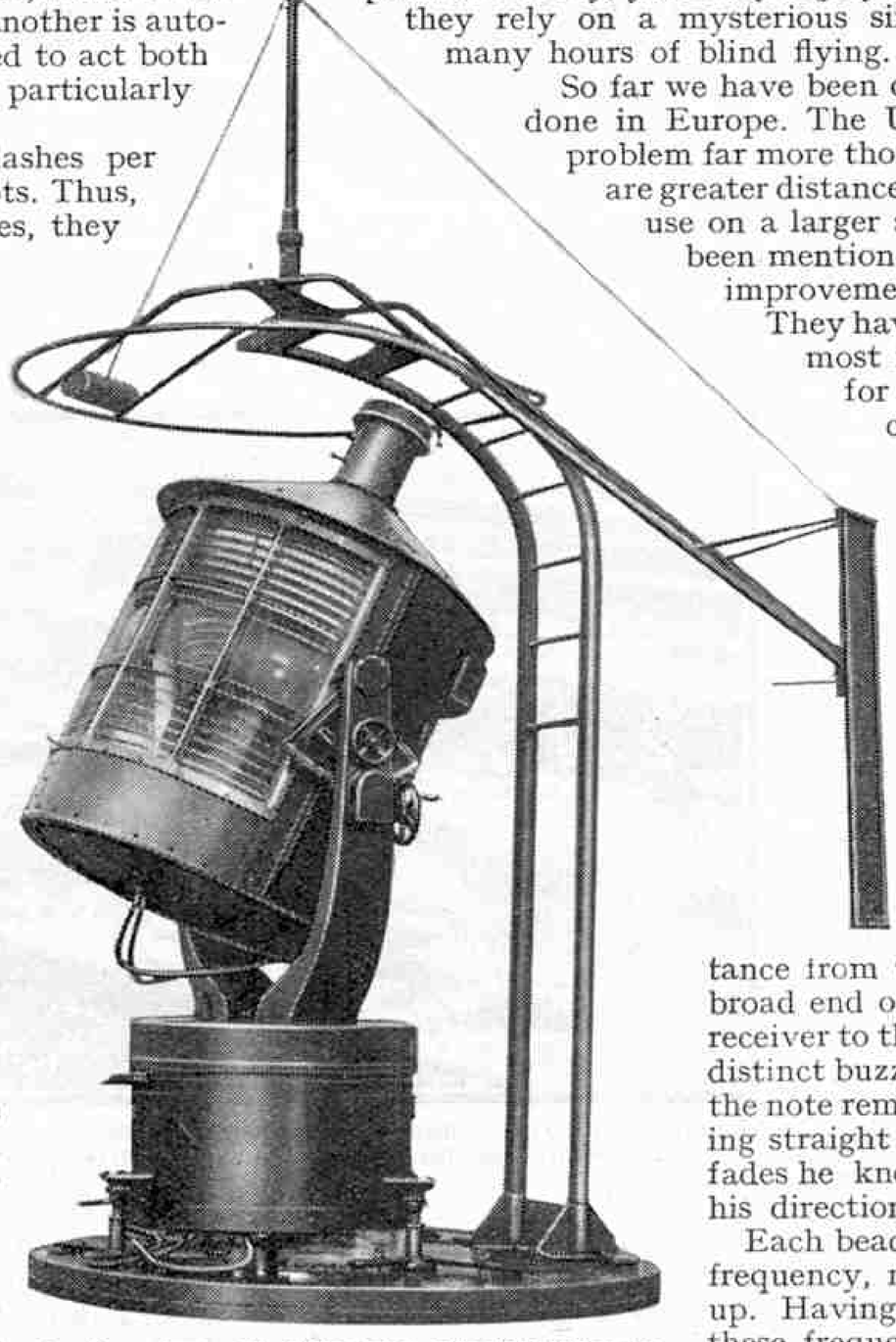
Anything happening to this building, or its staff, would mean immediate disorganisation of the entire airport. Though such a situation is unlikely, modern airports are doing their best to be prepared for anything. Most of them are now equipped with complete emergency electric lighting, ground flares, and mobile floodlights mounted on tractors.

Now a word about the smaller, though equally important, obstruction indicators and boundary lights. The former are simply 60 candle-power lamps in scarlet shades. The latter are amber-covered and mounted 3 ft. above the ground on steel posts, and they enclose the area where it is perfectly safe for aircraft to land. There may be some distance between them and the boundary fence of the aerodrome, but the intervening ground is often not suitable for landing. It is a mistake to think that the orange lights mark out the actual shape of the aerodrome.

Many people do not realise that, weather conditions being favourable, it is not difficult for a night pilot to see where he is flying. Although detail is wiped out, every irregularity on the Earth's surface is thrown into relief, giving it the appearance of a contour map. The lights of towns are easy to pick out, while illuminated landmarks such as location beacons are visible at great distances. Indeed, some people prefer flying through a clear night to daytime flying. But that is night flying at its best; when there is fog or heavy clouds things are very different. A pilot then has only his instrument readings and instructions that have been given him by wireless to rely on.

Every commercial pilot must pass a stiff test of "flying under the hood"; that is keeping a machine on a fixed course, and an even keel, while the cockpit is covered over by opaque fabric. In such conditions a pilot's instrument board takes the place of his senses. Altimeter, compass, wind speed indicator, dials showing the machine's angle in relation to the ground—these and many more play a vital part. Obviously; yet many highly experienced pilots maintain that they rely on a mysterious sixth sense only acquired after many hours of blind flying.

So far we have been dealing with night flying as it is done in Europe. The United States have tackled the problem far more thoroughly, probably because there are greater distances to be covered. Not only do they use on a larger scale all the apparatus that has been mentioned, but in addition they employ improvements almost unknown over here. They have a system that provides, on the most important air lines, "skyways" for airmen. Although the pilot cannot see them, they are as real and definite as a paved road, and will lead him to his destination just as surely. Radio-beacons make this possible. Imagine an automatic radio-transmitter placed at the head of a much-used air route. Continuously it sends out a wedge-shaped beam of wireless waves. In one dimension, up and down, the beam covers practically an unlimited range; across, however, it is first narrow—only 100 ft.—but broadens out to seven miles on 100 miles' distance from the transmitter. Flying into the broad end of the wedge, a pilot tunes in his receiver to the waves until he hears them as a distinct buzzing note in his earphones. While the note remains audible he knows he is heading straight along the beam; but if the note fades he knows he is off course, and alters his direction until the sounds strengthens.



Another type of "Chance" Floodlight-Beacon. On the right is the shadow-bar, which is moved in front of the light when the Beacon is in use.

Each beacon sends out notes of a different frequency, needing different tuning to pick up. Having learned the relation between these frequencies and his tuning dial readings, the pilot is able at once to name the point for which he is heading. Only lateral movement, not altitude, effects the reception of the buzzing note.

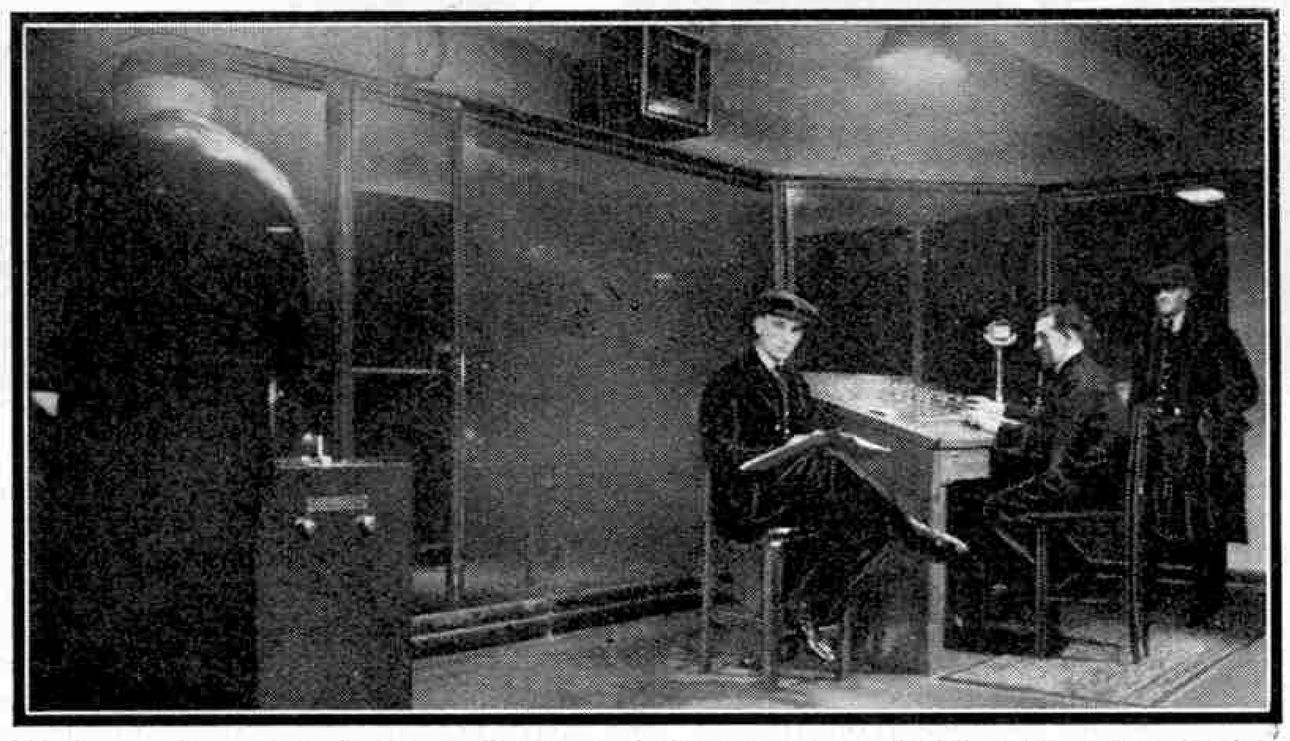
Between two radio beacons there is sometimes a silence zone, where no signals can be picked up. The pilot has then to carry on with his instruments and wireless instructions.

A Notable Marshalling Yard

Hump Shunting at Hessle (L.N.E.R.)

By a Railway Engineer

THE hump or gravity principle has been used for many years in railway marshalling yards, both as a means of reducing shunting engine mileage and also to make the sorting of goods trains easier generally. It is, however, only since the invention of the rail brake, or car retarder as it is called in America, that the great potentialities of the system for speeding up traffic have been fully realised. At Hessle, on the L.N.E.R. near Hull, there has recently been opened a remarkable example of a fully-mechanised yard, for dealing with all incoming freight trains. It lies to the north of the main line at a point about 3 miles west of the city and is used to sort all traffic for the various docks and goods stations in Hull, and also for destinations to the north-east, such as Hornsea, Withernsea and Bridlington.



Night operations at Hessle Marshalling Yard. A typical scene inside the control tower showing operators at the control panel and, in the left-hand corner, manipulating the rail brakes.

The tracks are laid out on what is known as the "balloon" system. Each train on arrival at Hessle is placed in one of the six reception sidings, and these tracks converge to a single line of rails that leads over the hump; the seventh track on the reception side is used only by light engines. The gradient on one side of the hump is as steep as 1 in 18. The entry to the reception sidings is under the control of Hessle Haven signal box, on the main line, but the hump yard inspector gives the signalman instructions as to which of the six reception sidings is to be used for each arriving train; this is done by means of an illuminated number indicator in the signal box operated by push buttons in the shunter's cabin at the top of the hump.

Each train is completely sorted out in one long continuous push. When it arrives in one of the reception sidings, a shunter walks along its length noting the destination of each wagon. It may happen that several trucks in succession are bound for the same place, but in any case the whole train is uncoupled into a series of sections, each of which is bound for a different destination. These sections are known technically as "cuts." A card giving a list of all the cuts, and their destinations, is then dispatched, by pneumatic tube, from a shunter's cabin at the top of the hump to the control tower, so that the operator can set the points to switch the cuts into their correct sidings.

In the meantime the humping engine has been attached at the rear and all is ready for the remarshalling of the train to begin. At Hessle, North Eastern 3-cylinder 4–8–0 tanks are used for this job. As will be seen when I come to describe the points operation, it is very important for the speed of humping to be correct, and to ensure this all the engines employed are fitted with precision speedometers. The rate varies between three and four miles per hour, and the actual speed required is communicated to the driver by means of a signal of special design, the aspects of which signify "Fast" and "Slow" speed respectively.

As each cut passes over the crest of the hump, it quickly gathers speed down the 1 in 18 grade and separates from the one following; and on reaching the first pair of diverging points it is travelling at nearly 20 m.p.h. At this speed, although there is an appreciable distance between successive cuts, there is a time interval of three seconds, at the very most, between the passage of the last truck of one cut and the first truck of the next; in this very short interval the points have to be moved.

Nothing short of automatic operation would meet such a case, and it is carried out in a most ingenious way. Near to the first diverging points is the control tower, a three-storey building in which the uppermost room houses the control panel. This is rather like a big sloping desk, on the top of which is laid out an exact replica of all the sidings. Instead of the usual type of lever in an interlocking frame, each pair of points has a thumb switch placed at its actual position on the map of the sidings; while tiny coloured lights on the tracks adjacent to the switch show how each pair of points is lying. For automatic working, each thumb switch is set in its mid-position, but the operator can move any individual pair of points by moving the switch either way. Before doing this, however, he has to operate a master switch that puts the automatic working out of use for the time being.

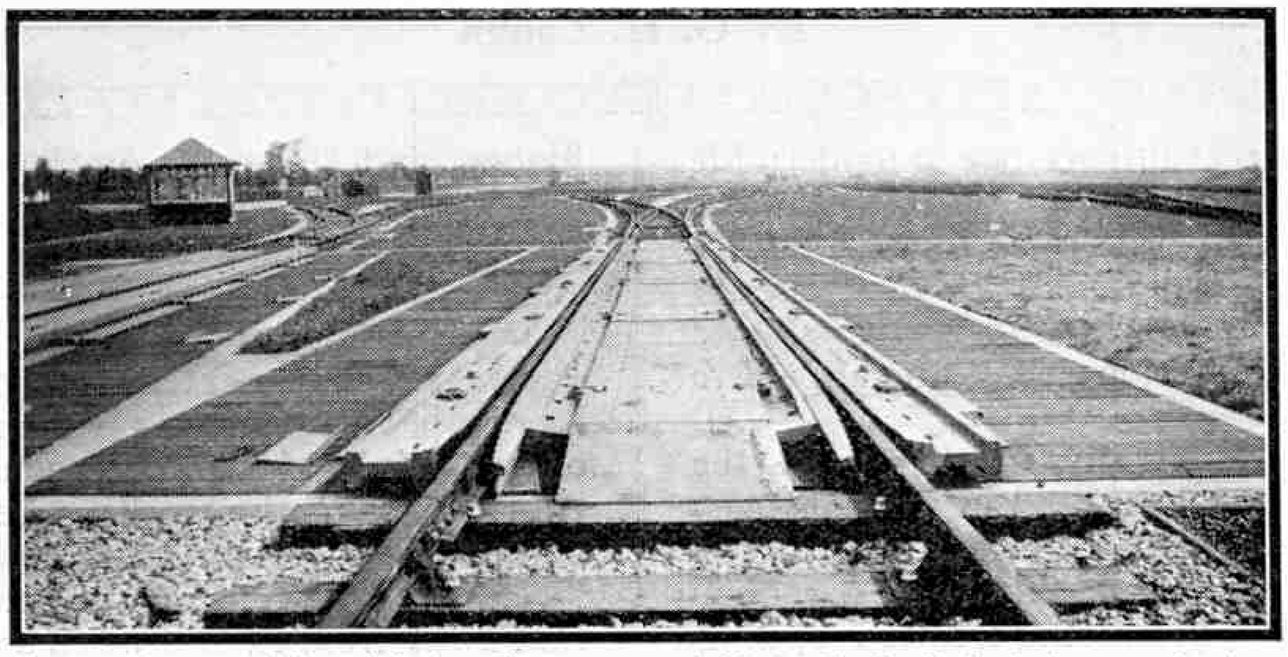
In the ordinary way, the points are worked automatically. Along the lower edge of the control panel is a row of 30 push buttons. The track over the hump forks out into 30 different sidings, and by depressing one of these buttons all the points on the route are set at once; there is no need for each individual thumb switch to be moved. The cuts follow each other so quickly down the hump that you cannot possibly wait for one truck to reach its final siding before setting the route for the next. By an elaborate system of electrical circuits, it is so arranged that directly one cut has cleared the first pair of diverging points the operator can set the route for the next; and although the route button has been depressed, the operation of each pair of points is delayed until the first cut is safely through. Even though a splendid look-out has been provided from the control tower, it would not be possible for the operator to judge the correct moment for setting the next route from watching the trucks, so brief is the interval between them; and so a red light on the panel is provided to show, by its lighting up, the exact moment when a truck is passing the key position. In a similar way, other red lights show the progress of trucks through the whole yard.

Points-operating mechanism, showing the air cylinder attached directly to the points, also the electro-pneumatic control apparatus.

Directly the operator receives the cut card from the shunter, the first route is set up and a signal given to the driver to start humping. When the trucks start running down the 1 in 18 grade, all that the operator, with the destination card in front of him has to do, is to watch the red light at the key position, and set the next route as each truck passes. To help the operator, a special green light that indicates "Next Route Clear" lights up at the critical moment, and a buzzer sounds at the same time. In this way a train of 100 wagons is completely sorted out in about six minutes.

Humping at 3 m.p.h. means that the trucks are travelling fast after they have passed over the first diverging points, and it is now

that the rail brakes come into the picture. Of the 30 sidings into which cuts can be sent, some may be almost full of trucks while others are nearly empty; and it is the function of the brakes to slow each cut down to the exact speed necessary to carry it to the end of the available space in the siding, and bring it gently into contact with the wagons already there. The brakes are placed just beyond the second pair of diverging points, where the tracks have spread out into four. They consist of 75 ft. beams on both sides of each running rail, which, when power is applied, move towards each other and grip the wheels of a wagon as it passes through. They are operated hydraulically, and the actual braking pressure can be varied through a wide range.



A view along one of the rail brakes. These are operated hydraulically, the brake beams embracing the wagon wheels as they pass along the rails.

All four brakes are under the control of one man and considerable skill is needed to get successful results; for the braking power required depends not only on the siding space, but also on the weight of the cut and the direction of the wind. A lightly-loaded wagon running into a high wind requires much less than a heavy one travelling with the wind. Care has to be taken also with loosely-packed loads; if heavy pressure were applied to a fast-running wagon, the retardation would be so sudden as to shoot a considerable part of the load right out of the wagon. In such a case the operator gives light braking at first, and increases the pressure as the truck passes through. Unlike his colleague at the point control panel, the brake operator depends very largely on a good look-out from the tower, and at night the yard is floodlighted.

Water pressure is maintained automatically at about 1,600 lb. per sq. in. by means of powerful pumps working in conjunction with a hydraulic accumulator. The latter rises to the full height of the control tower, and is accommodated at the back of the control room. The accumulator consists of a vertical cylinder in which the water pressure supports a piston carrying an enormous circular 40-ton weight. When the rail brakes are operated the water pressure is reduced and the weight falls a certain amount; then the pump automatically starts up, and by increasing the pressure in the vertical cylinder the weight is gradually raised until full pressure is restored. Then the pump automatically stops. Occasionally, when a succession of very short cuts is being humped, three, or even all four brakes are on at once; then, for a fraction of a second, the great 40-ton weight descends in a positively terrifying manner until it is checked by the increased pressure caused by its own fall. To prevent freezing up during cold weather, a small percentage of glycerine is added to the water.

The control room has been superbly designed. On three sides windows extend from ceiling to floor, and the look-out is only interrupted by the slenderest of pillars. A large awning over the windows is provided by extending the flat roof of the tower.

A striking night photograph of the control tower. This shows the adjacent floodlighting unit that is used for "spotting" the progress of the wagons.

It is the floor below the control room, however, that contains the heart of the whole system. At first sight it looks like a miniature telephone exchange, for in three steel cabinets hundreds of relays are housed. This resemblance to a telephone exchange is not merely one of outward appearance; each time a route is set up by pressing one of the buttons on the panel, the relays, electrically interconnected, perform a series of operations very similar to those that take place when a telephone line is called by dialling. Each button when depressed operates a particular group of relays, which through their contacts apply power to the necessary points mechanism. In addition to these tiny control relays there is another cabinet that houses the track indication relays. These are similar to the ones used for track circuiting in ordinary power signalling; highly sensitive instruments, they are used for detecting the presence of a truck in any part of the yard, and through their contacts the red lights on the panel upstairs are illuminated.

With such complexity of circuits, great care has to be taken to arrange the wiring so that each individual circuit can be quickly traced out. In the case of the heavier cables, small tags are attached bearing identification marks; but with the small telephone-type wires braiding of a great variety of colours is used, by which any particular circuit can be readily picked out. On the ground floor of the control tower are the air compressors for the points operation and the hydraulic pumps for keeping the rail brakes supplied.

Even though the points are operated automatically, the time available is so short that very quick throwing is necessary. Unlike tracks over which passenger trains are run, no facing points lock is required, and this helps to save time in operation. A powerful pneumatic cylinder is attached directly on to the points stretcher rod. The air supply to this cylinder is controlled by an electro-pneumatic valve that gives very rapid admission and exhaust of air. Also coupled to the points is an electric detector, which proves that the switches are fully home in either direction, and indicates this to the operator by a yellow light on the control panel. If, on account of a small stone or other obstruction, the switches failed to close by as little as one-eighth of an inch, no light would be shown on the panel, and traffic could not be put over the points. In actual practice the complete mechanism has proved to be the fastest points-operating machine ever built. When working the points individually by means of the thumb switches on the panel, the time taken is less than one second, during which interval a number of relays have operated, the points have thrown, and the detector, having proved everything correct in the new position, has lighted the appropriate yellow lamp on the panel! When working automatically the operation is even faster.

The whole yard is beautifully laid out. The track alignment has to be maintained very accurately in order to give the smoothest possible running for the wagons. Concrete edging is used to keep the ballast in place, grass verges line the embankments leading to the hump, and in the V-shaped spaces where the tracks diverge are grass plots. The control tower, in addition to being carefully designed from an operating standpoint, is a very pleasing example of modern architecture, and the general layout has an elegant appearance quite unlike that of an ordinary railway goods yard.

The control room is a fascinating place at all times, but especially at night. The floodlighting has been very carefully arranged, and from the moment the wagons pass over the hump each one can be seen picked out as though by a theatrical spot-light. The constantly changing red and yellow lights give the control desk a singularly beautiful appearance. A small point, but one that leaves a lasting impression, is the remarkable quietness of the working. Hardly a word is spoken between the operators in the control room; there is an occasional order given through the loudspeakers installed in the yard, but apart from that there is only the sharp grinding noise as each cut passes through the brakes. This alone is a welcome change from the incessant racket of an ordinary shunting yard. In a normal day 2,500 trucks are dealt with, but if necessary 3,000 or more could be got through.

The yard was brought into service early in December 1935, and less than a fortnight later it was subjected to a test of the most extreme kind imaginable. In the days immediately before Christmas, fog almost unparalleled in its severity hung over the whole country; but the yard dealt with the heavy Christmas traffic at practically normal speed. The visibility was absolutely nil at times, and although the progress of wagons could be followed on the point control panel, the brake operator had to judge his distance from the sounding of the "Next Route Clear" buzzer.

Importance of Refractories in Industry

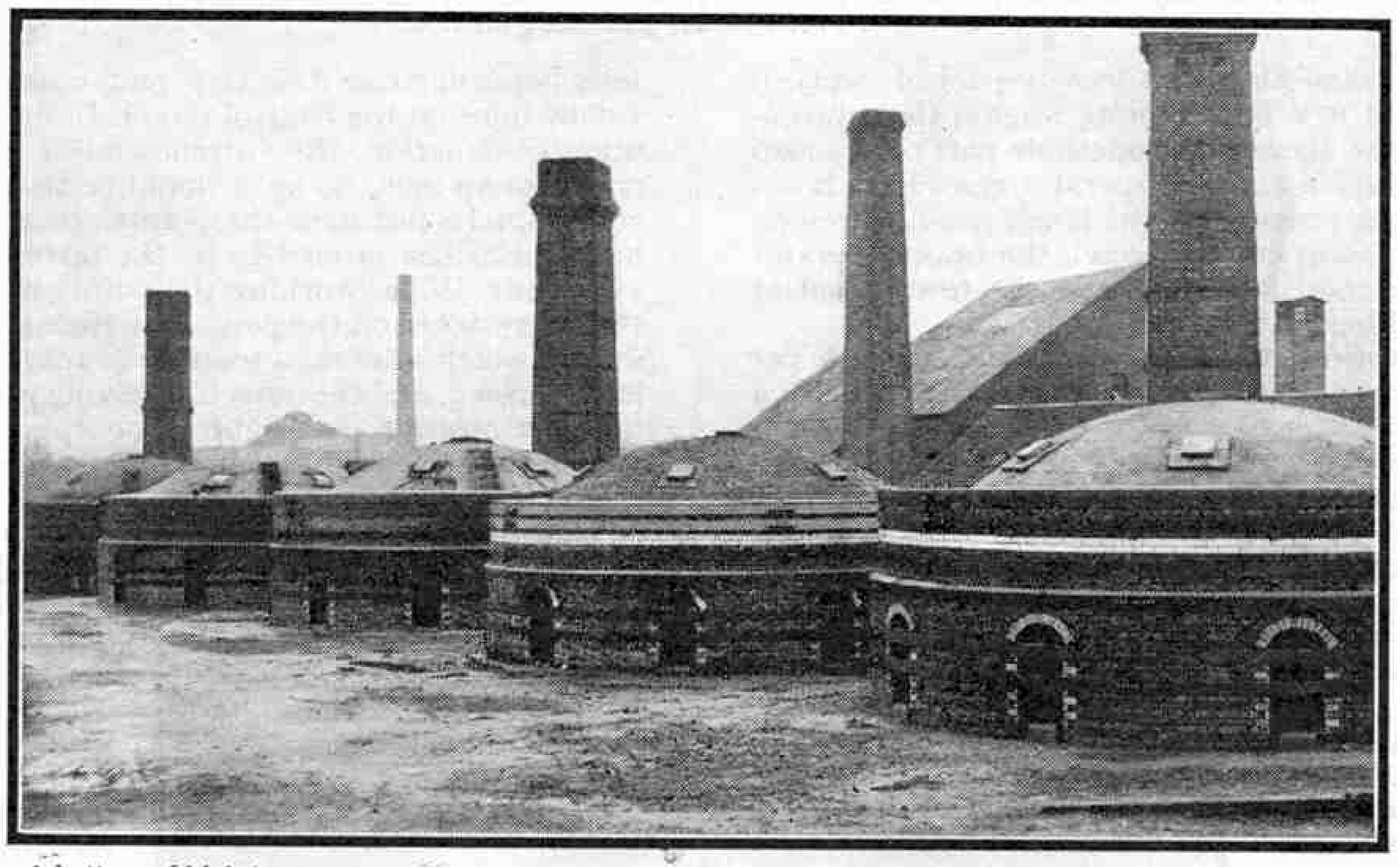
Linings for Steel Furnaces

By G. H. Lohan

FEW people realise the great importance in modern life and industry of the products known as "refractories." The ordinary meaning of the word "refractory" is unruly or stubborn, and it has a special application to articles or materials that are difficult to melt, and are capable of withstanding the severe conditions that prevail where intense heat is employed.

Refractory materials are equally important in the manufacture of domestic fireplaces and in the construction of the largest furnaces employed in iron and steel making. Little is heard of them, and of the great part they play in the production of more imposing creations such as great ships and giant bridges, yet it can safely be said that we should still be in the Stone Age if we had not learned how to make good use of them.

Refractory materials are required to remain unchanged when everything with which they are in contact has been reduced to a molten mass, or completely burned away. They must retain their shapes when subjected to the pressure and "wash" of tons of boiling steel melted in the furnaces of which they form the linings, and must be resistant to the destructive effects of the hottest slags, gases and flames.



A battery of high temperature round down-draught kilns capable of reaching a temperature of 1,600 deg. C. They are at the Worksop works of General Refractories Ltd., Sheffield.

Comparatively few common materials would pass unscathed through such vigorous tests. Of those that are suitable, the best known and most widely used is fireclay, from which is manufactured the heat-resisting brick commonly known as the firebrick. Fireclay is used in making fireplaces for houses, and in various shapes is employed in building the furnaces in which metals are melted. It enters also into the construction of boilers of all kinds, power stations, gas works and coke oven plants, and indeed is used to line the kilns in which the firebricks themselves are made.

Fireclay is the product of a process of rock destruction that has extended over a period of millions of years. Ever since the Earth became cool, the rocks on its surface have been subject to the action of the Sun, rain, wind and ice, and have slowly been broken up to form the fine-grained mixture of minerals, usually plastic in character, that we call clay. The nature of this material of course depends on the character of the rocks from which it was formed. Some clays are more refractory than others, that is, the temperature at which they fuse is higher; and these are fireclays. A good fireclay is not usually very plastic, and a certain amount of clay that is more readily moulded often is mixed with it in order to enable bricks to be shaped more readily from it.

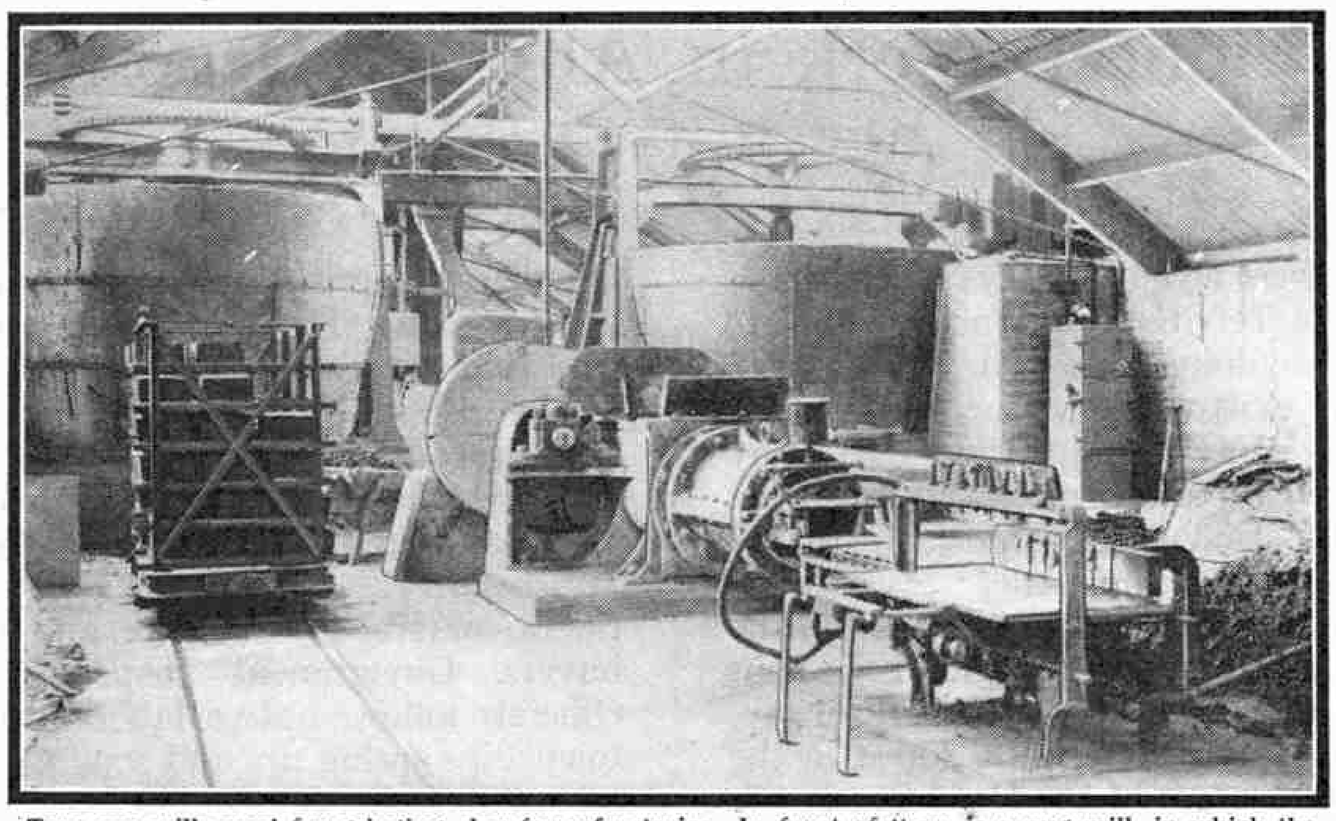
The method of extracting fireclay from the earth depends to a large extent on the nature of the deposit and its depth. In some cases it is mined underground, and in others it is worked in an open pit or quarry. It is then transported to the works, where usually it is stored in an open yard for a considerable time in order to become "weathered." No attempt is made to keep the wind and rain away from it, and weathering by these elements not only causes the breaking up of large lumps in the material, and makes this more plastic, but also removes oxides and sulphides of iron, thus improving the fireclay as a refractory material. If these impurities are present in the clay, they may cause serious damage both in the manufacture and use of the firebricks made from it.

When the clay has been weathered for a sufficiently long period, it is taken to the works and the manufacture of firebricks or other shapes begins. The raw material is first broken into small lumps in a crusher, after which it is conveyed to a pan mill to be ground. During the grinding process water and plastic clay are added, together with a certain proportion of calcined or burned fireclay, which is known to the brickmaker as "grog." This helps to strengthen the final product and to reduce the shrinkage that occurs during drying and burning. The proportion required varies with the nature of the clay used, and when a special type of brick is required both raw material and grog are carefully graded.

When the mixing is complete, the brick-batch, as the product is called, is taken to the making sheds, where the shapes are manufactured either by hand or by stamping in machine presses. The shapes are then carefully dried on floors heated by means of steam pipes beneath them, or by the use of waste heat from the kilns. They also may be dried in specially constructed ovens or tunnels. Drying is one of the most important stages in the manufacture of the bricks. Great care must be taken to maintain a steady and constant temperature throughout the process, so that the moisture present in the bricks may be driven off at a uniform rate. The finished product would be cracked if this moisture were turned into steam too

rapidly while the bricks are in the drying stage.

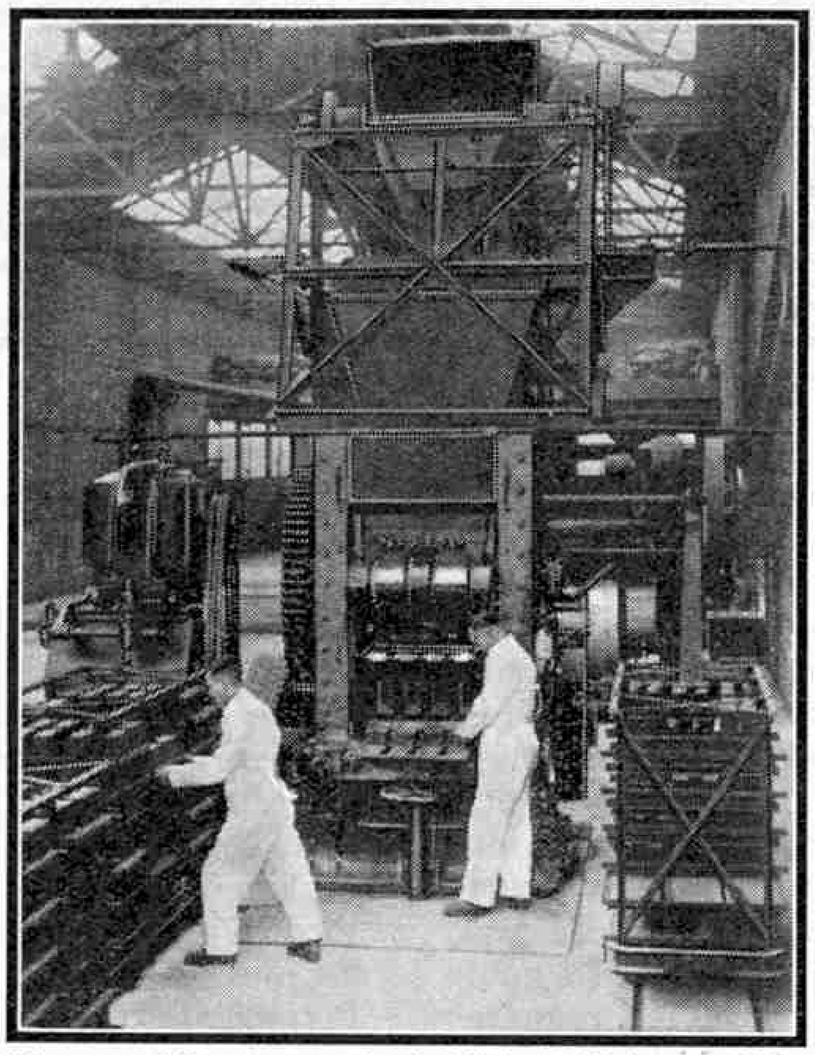
Bricks and shapes that have been thoroughly dried are set in the kiln and fired, or "burned," to a temperature ranging from 1,200 deg. C. to 1,450 deg. C., according to the type of ware being fired and the class of work for which it is to be used. Various types of kiln are employed. The two most in favour are known as the round down-draught and up-draught kilns respectively. In the former the heat travels from the fire holes up to the crown or roof of the kiln. It then passes downward with a circular motion, heating the bricks as it passes through them, and finally makes its way through a hole in the floor to the flues leading to the "stack," or chimney. Up-draught kilns work in the reverse manner, the fire leaving through a hole in the roof.



Two pan mills used for grinding clay for refractories. In front of them is a pug mill, in which the raw material is made into clots so that it can be calcined more easily.

The object of burning the bricks is to melt certain of their constituents and thus to bind their particles together in one hard, solid mass. The temperature of the kilns must be raised very slowly until 900 deg. C. has been reached. The purpose of this is to drive out chemically combined moisture and carbonaceous matter. Heating can then be more rapid, and when the temperature has risen to that agreed on for firing, all air passages to the kiln are stopped up and heat is allowed to "soak" through the bricks. Soaking is costly, but it improves the products considerably, making them harder and more durable. After firing they must be cooled very carefully, for the too rapid lowering of temperature by any sudden rush of air might give rise to cracks and splinters.

During recent years the introduction of special steels has made it necessary to provide what can best be termed super-refractories, and in order to keep ahead of the demand manufacturers have continually to find new refractory materials and to devise methods for improving those already in use. Other materials that are now employed as refractories include silica, magnesia and chrome iron ore. Silica is found naturally in the forms of sandstone and quartz. It is highly refractory, and sandstone ground with a little lime or clay to bind it together is used in making silica bricks. Magnesia is made by calcining magnesite. Its melting point is 2,500 deg. C., but most magnesite bricks, as those made from it are called, contain a certain proportion of iron oxide and so have a refractory value equal to about 2,000 deg. Chrome iron ore contains both iron and chromium, as its name suggests, and together with alumina is the basis of "Diazite" bricks, which are now used in place of magnesite bricks in many British and continental steel works.



The powerful press recently installed at Worksop, which exerts a pressure of 200 tons per brick, making four bricks per stroke at the rate of 750 bricks per hour.

In the works of General Refractories Ltd. at Worksop are examples of the most modern plant for making super-refractories, including magnesite and "Diazite" bricks. The plant employed is unique, and before designing it the engineers of the company paid visits of inspection to refractory works in many parts of the world. It is so arranged that the material is not touched by hand throughout the process of manufacture.

The bricks are made up from constituents that have been carefully graded by means of vibratory screens, and are proportioned in each mixing to give the best results in the finished products. Tests are made continuously during the various stages of production to ensure that only super-refractories are produced.

The bricks are stamped out by a giant press that is illustrated on this page. It makes four bricks at a stroke and is capable of producing 750 bricks an hour. A pressure of 200 tons is exerted on each brick as it is made. From the press the bricks are run into tunnel driers, where the required temperature is maintained automatically by means of thermostats; and when dry they are burned in down-draught kilns of modern design. The temperature range employed is from 1,450 deg. C. to 1,600 deg. C.

It is interesting to note that the magnesite bricks when burned weigh up to 13½ lb. each, and each "Diazite" brick weighs up to 15½ lb. The company are now equipping works in other parts of the country with similar plant in order to meet the demands of British steel makers for bricks that will withstand the higher temperatures of their furnaces, and to render the necessity for relining these, involving temporary loss of output, less frequent.

Obviously high temperatures show a large increase in works fuel consumption. This has been overcome by the introduction of insulating bricks. These are used on the outside walls of furnaces and industrial heating plants. In addition to stopping heat losses, they enable furnaces to be raised to higher temperatures without additional fuel cost. With the kilns illustrated on the opposite page this saving amounted to over 35 per cent.

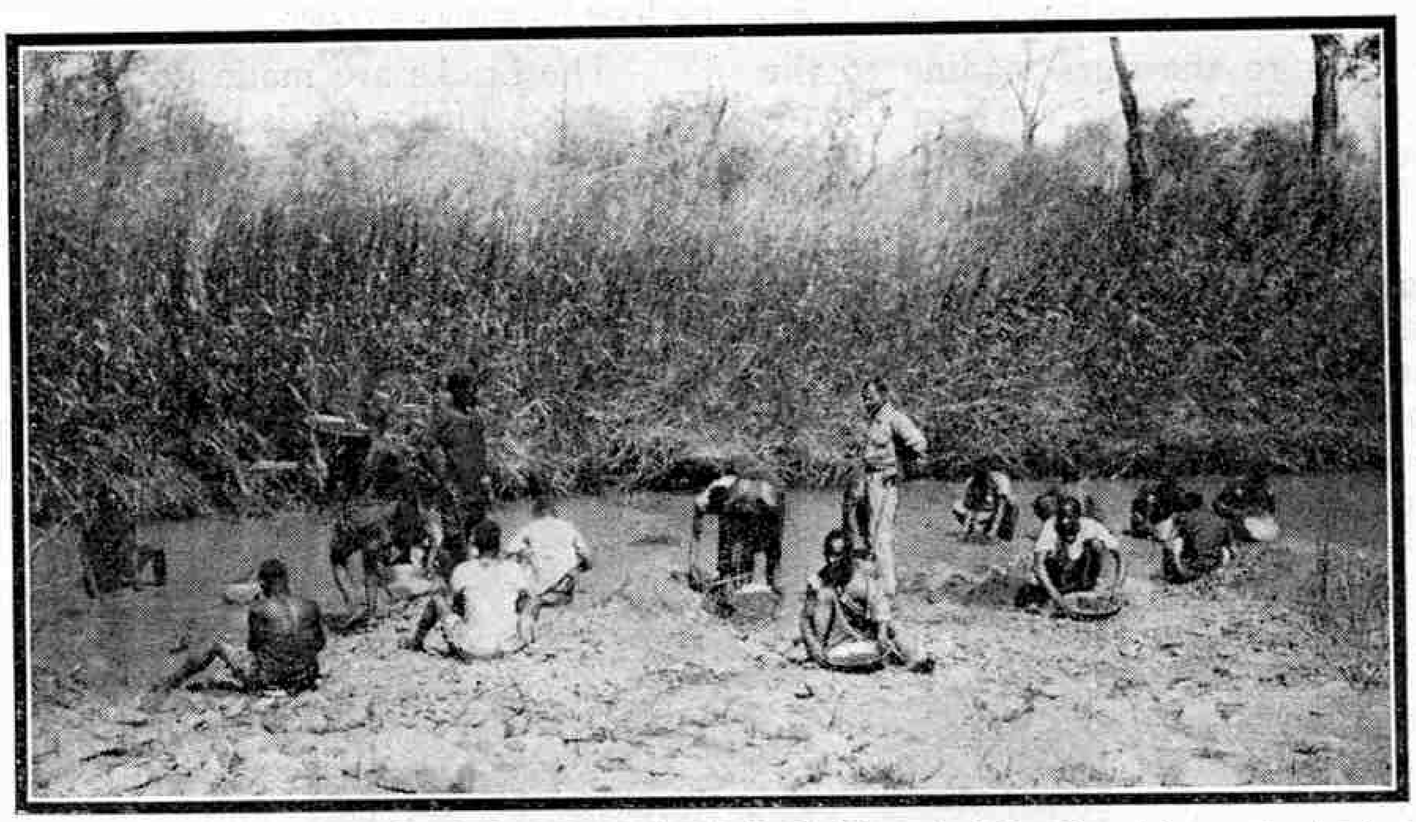
Digging for Gold in East Africa

Pioneer Work in Alluvial Deposits

By C. Maxwell Norman

A FEW years ago there were no gold diggers in the Lupa district of Tanganyika Territory, but now there are about 750. Some of them are doing very well, but most are only scratching out a bare existence. For the unsuccessful ones there is always the hope that any day they may strike a rich pocket of the precious metal and make a fortune, and to men with such a belief hardship means nothing and starvation is part of the game.

Gold was discovered in the Lupa District in 1923 in the gravel of the bed of the Lupa River. The region lies about 300 miles south-west of Dodoma, on the Central Railway, and is a hard country, verdant with tropical forest in the rains, but arid as the desert verges of the Dead Sea in the dry season. When the rains cease, the sun scorches every leaf and blade of grass to a sere yellow, the streams and rivers are dried up and the soil is baked to a hard red dust, so that a man might die of thirst if he did not take the precaution of establishing water bases for himself, or learn the whereabouts of the few water holes where wild creatures drink.



Panning in the Lupa river during the dry season, when the level of the water is low. Gravel for panning is being brought from diggings near by.

Quartz reefs carrying gold are scattered about the region and are mostly hidden by an overburden of soil. As the years have gone by, the outcrops of these reefs have been eroded, and rubble and gravel have been broken off and carried away by streams, so that now large areas of ground have a layer of gold-bearing gravel just below the surface. It is from this gravel, and from the sand in the dried-up river beds, that the digger wins his gold. Usually he recovers only the finest of tiny particles, but occasionally nuggets are found in rich pockets. Nuggets weighing an ounce are not infrequent, and several weighing as much as 50 oz. have been discovered. In 1927 a nugget weighing 120 oz. and containing 76 oz. of pure gold was unearthed, and two years later one digger obtained gold worth £1,000 in eight days' work. A man who is fortunate enough to make such a discovery may lose his money during months of unproductive work afterwards, however, and it is only the few who can be called successful.

The story of a gold rush in East Africa begins with the wanderings of a prospector, accompanied by a few native bearers. With him he carries a pan, an iron dish with sloping sides that is used for washing gravel in search of gold or other heavy minerals, making bread, carrying water or frying steaks from game animals he has shot. Whenever he comes to a likely place, such as the bed of a stream, he pans a little of the gravel to see if it contains any gold, for there is always the chance of finding the metal. It was in this way that the Lupa goldfield was discovered.

The rush itself follows if the prospector is successful. The news spreads when he turns up at some town with a pile of gold and sells it to the local bank. Gold news travels quickly and soon men of all types are on the trail of fabulous riches "up country." Later come the traders, Indian transport riders, native storekeepers and Greek and Italian gold buyers. Government Inspectors, Police, and District Officials follow, native labour drifts into the area, small townships spring up, and soon the whole district possesses an ever-changing population, all following the fickle goddess Luck.

At a pinch, digging can be started with a capital as low as £5. The aspirant begins by going to the nearest Mines Office, where for 10/– he equips himself with a Prospecting Right that entitles him to hunt for minerals and to peg claims. He hires a few natives at 9/– a month and food, which costs as low as 5/– or 6/– a month per boy, and sets off. He may have a "hunch" where to go, or he may just wander up and down streams, or trek across country examining the soil and rubble beds on the watershed areas between the streams. Usually he starts out in the wet season and pans his way along, but some prospectors roam about during the dry season in order to locate likely places for work when the rains come and ample water is available.

There are two kinds of panning, wet and dry. Where there is water, the sand, rubble and gravel are loaded into the pan, which is held under water while lumps of clay are broken up with the fingers and the stones are removed and thrown away. Then the pan is given a shaking and a swirling motion to make the heavier particles sink to the bottom. Periodically the top is scraped off, and this process is continued until there is left only a small proportion of fine sand consisting usually of black heavy particles. Mixed with it is the fine gold-dust, the heaviest of all the grains in the pan. This remains until the last, and the whole of it can be recovered by a skilful panner. The prospectors themselves are often unskilled, however, and the panning usually is left to the natives, who allow much of the finer gold to escape.

Dry panning is a very tedious process. The soil and gravel are first laid out to become thoroughly dry, and all lumps are pounded with a stick or stone to break them up, and

rubbed through the fingers. A pan is then loaded and the same shaking and swirling motion is applied as in wet panning. As the heavier minerals sink to the bottom, the pan is swirled in such a way as to allow the soil and gravel to spill out at the rim, a process that is helped by a little judicious scraping. Finally a heap the size of two clenched fists remains, and this is tossed up and down while the operator blows strenuously on it. Eventually nothing is left but the gold—if the metal is present.

Sluicing gravel from the banks of a stream. The gold is caught behind the riffles or cleats in the sluice box.

The prospector who finds gold must next peg his claim, or anyone could come and take it. A claim is 300 ft. long and 100 ft. wide, and he measures this area out, and places beacons at the corners with boards or plates on them that state all the necessary particulars. Sometimes more than one claim is staked out. The discoverer then hurries in to the Mines Office to register his finds. Once that has been done, he has the sole right to work them.

Now comes the serious part of the digging. The gold seeker hires more boys and supplies them with pans, picks and shovels. A camp is made by erecting a square hut built of raw poles cut in the bush, with sides and roof thatched with grass, and putting up a few similar round or square huts for his boys, and then he gets to "work." For the most part this consists in allowing the boys to pan all day long. They work from sunrise until about three or four o'clock in the afternoon, and then they bring up the gold they have retrieved. This is weighed and they are paid a bonus of anything up to 20 cents per pennyweight, or about 2½d. for one twentieth of an ounce.

Dry blowing for gold. The gravel is pounded in a pan, shaken and swirled round, and the lighter waste matter is blown away.

The law prohibits natives from possessing or dealing in gold, and stipulates that the maximum bonus shall be 20 cents. This is done in order to prevent illicit dealing and theft, but there are always men who pretend to work a claim for the purpose of covering up the fact that they are buying stolen gold steadily, at rates much higher than the legal maximum. This gold of course really has been won by natives working for other diggers, and its buyers are tough customers and difficult to deal with.

Periodically the digger makes a trip to the nearest "town" to sell his little store of gold to the local traders, who usually are licensed gold-buyers. He probably takes half the value of the metal in native foodstuffs and provisions for himself, and the other half he banks unless, as is frequently the case, he loses it in gambling.

Panning is not the only way of winning gold from alluvium. Different people have different methods, and much depends on how much capital a digger has. In the dry season a dry-blower may be used. This consists of a galvanised iron structure containing a crude fan that is rotated by means of a small petrol engine. The air current so produced is driven through a trough or hopper into which the broken-up gravel is slowly dropped. The heavy gold and "black sand" then drop down into a box below, while the lighter waste matter is blown away.

A wooden sluice box is used if water is available. The upper part of this is a launder or trough, sloping slightly towards one end, into which the broken-up gravel or "pay-dirt" is shovelled, or tipped from pans, while natives bail water from the stream and pour it over the top. As the gravel passes down the launder, the larger stones are picked off, and the remainder reaches a screen made of iron with holes punched in it. There it is again puddled up with the water, and the coarse light matter is removed by hand while the heavy particles pass through into the sluice box below. This also is a trough, but across it are placed riffles, or small cleats of wood, and the gold and black sand collect behind these obstructions. Periodically there is a clean-up, when the contents of the sluice are removed and the gold recovered by panning. Some miners use blanket to line the floor of the sluice box in order to give the gold something to stick to. Others put small amounts of quicksilver behind the riffles. The gold then dissolves in this metal to form an amalgam, from which it can easily be separated.

The life of an alluvial gold miner in Tanganyika Territory offers few attractions to the man who likes companionship. If he is diligent and sober-minded he goes out with his natives, teaching them and watching them at work. Most diggers prefer to leave everything to their boys, however, and are content to give them their daily rations of mealie meal and to check in the gold every evening. Food supplies are obtained by occasional journeys to the nearest trader, and meat by the use of the rifle. In the evenings there is little to do but to get to bed! It is scarcely surprising that many of those who endure such a lonely existence show a tendency to "go wild" when they return to civilisation, especially when their pockets bulge with money the local dealer has given them in exchange for their gold.

L.N.E.R. Developments

The L.N.E.R. have placed an order with Robert Stephenson and Co. Ltd. for 11 locomotives of the 3-cylinder 4–6–0 type. These will be similar to the existing B17 engines of the "Sandringham" class. Beyer, Peacock and Co. Ltd. are to build 28 goods locomotives of the 0–6–0 "J39" class. Tenders with a water capacity of 3,800 gallons will be provided for 19 of them; the remainder will have 4,200 gallon tenders.

A modified form of streamlining has been applied to a five-coach articulated set that works on the 10.10 a.m. Leeds express from King's Cross. Rubber sheeting similar to that used on *"The Silver Jubilee"* train is applied between the coaches.

Thirty-five specially constructed wagons for the conveyance of containers have been ordered from the Birmingham Carriage and Wagon Co. Ltd. The supply of nearly 700 dynamos and over 12,000 standard cells for train lighting has been arranged with various manufacturers.

The now-famous L.N.E.R. *"Northern Belle"* cruising train is to run again during the coming summer. It will leave King's Cross at 9 p.m. on 29th May, 12th June, and 19th June for extended tours of the Highlands.

More "Zephyrs" for the Burlington Route

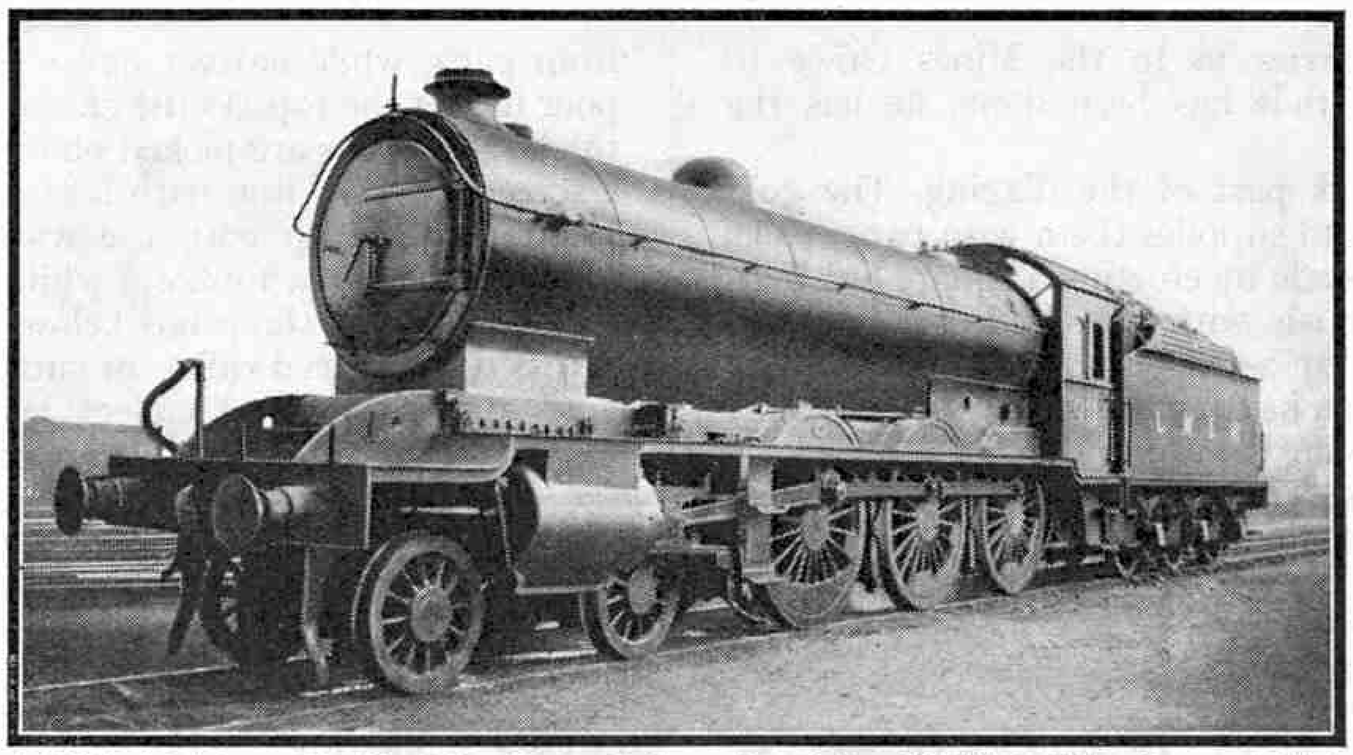
Following the success of the *"Zephyr,"* the stainless steel streamlined American train described in the *"M.M."* for April 1935, and its successors, the Chicago, Burlington and Quincy Railroad have decided to introduce two twin-engined trains of a similar kind. These are for service between Chicago, Omaha and Denver, a route 1,039 miles long that is to be traversed at an average speed of 65 m.p.h., including stops. A power-baggage vehicle at each end and four sleeping cars will be included in the make-up of each 10-car train. It is hoped that these will be put into service during the coming summer.

The two four-car *"Twin Zephyrs"* are to be replaced on the run between Chicago and the Twin Cities, Minneapolis and St. Paul, by two new seven-car twin-engined units. These will be wider than the present trains and will have much more passenger accommodation.

The G.W.R. "A1 at Lloyds"

One of the G.W.R. "Star" class locomotives converted to a "Castle," formerly No. 4009, *"Shooting Star,"* has been renamed *"Lloyd's,"* in compliment to the famous insurance institution. It is appropriately numbered "A1."

The naming ceremony was performed at Paddington by Sir Robert Horne, Chairman of the G.W.R. Mr. Neville Dixey, Chairman of Lloyd's, and members of the Committee of Lloyd's were present, together with the General Manager and the principal officers of the G.W.R. The nameplate of the locomotive was surmounted by Lloyd's coat-of-arms and the official house flag was flown. An unusual feature was the display between the chimney and the cab of a flag signal in the international code, reading *"A1 at Lloyd's."*



L.N.E.R. 4-6-0 locomotive No. 911, a three-cylinder engine of class "B16." An interesting run behind one of these engines is described on the next page. Photograph by Mr. O. S. Nock, Bushey.

Centenary of the First Railway in London

A special exhibition has been arranged at the Science Museum, South Kensington, to commemorate the opening 100 years ago of the London and Greenwich Railway. This was notable as the first railway in London. It was projected in 1832 and part of it, between Spa Road and Deptford, was opened in February 1836. A remarkable feature was that the line was carried throughout on a brick viaduct. It was hoped that the arches would be used as dwellings and warehouses, but as residences they were not successful. The extension to London Bridge was opened in December 1836, and the Greenwich end was completed in 1838. The line was leased to the old South Eastern Railway in 1845 and became merged in the Southern Railway in 1923.

The exhibition includes prints, books, pictures, medals and other relics loaned for the occasion by the S.R. and various private collectors. It will remain open until 30th April.

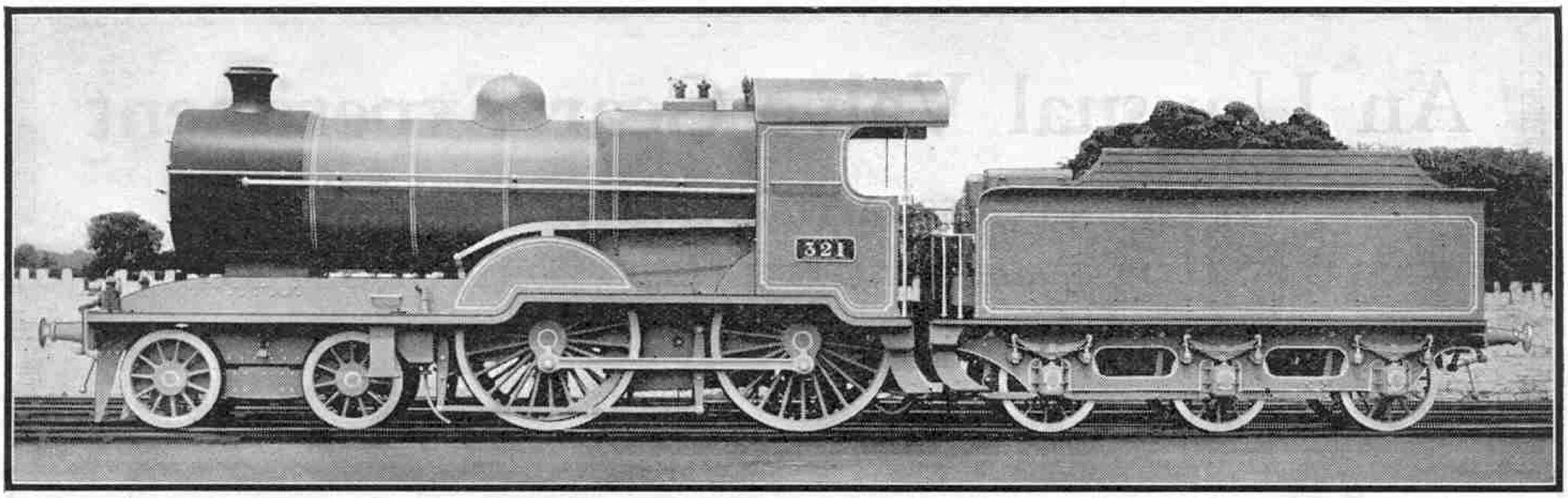
L.M.S.R. Locomotive News

At the time of writing the taper-boilered "Royal Scot" class locomotive No. 6170, *"British Legion,"* is working from Longsight on the Manchester and Euston service. On two successive days recently, trains headed by this engine regained time lost in the up direction. With 385 tons behind the locomotive, Driver Thomas and Fireman Walker made up 6 min. from Lichfield to Euston, the average speed being 68.4 m.p.h. for the 116¼ miles. The next day the same amount of time was made up by Driver Bowden and Fireman Shea between Nuneaton and Euston, the 97 miles being run at an average speed of 69.3 m.p.h., with 377 tons.

"Royal Scot" class locomotive No. 6126, formerly *"Sanspareil,"* is now named *"Royal Army Service Corps."* The naming ceremony was performed on 14th January last by Major-General W. K. Tarver, C.B., C.M.G., Colonel-Commandant of the R.A.S.C., in the presence of a gathering of officers of the regiment, and L.M.S.R. directors and officials.

Scrapping of G.N.R. "Atlantics"

Britain's earliest "Atlantic" locomotives, the small-boilered "990" series of the former G.N.R., are apparently doomed. Nos. 3982 and 3988 have already been withdrawn and the first of the class to be built, now No. 3990, also is condemned. This engine in its earliest form was illustrated on page 87 of the February issue of the *"M.M."* In view of its special interest as the first British "Atlantic" locomotive, its preservation by the L.N.E.R. in the Railway Museum at York would be welcomed by all interested in railways and locomotives. For many years the "990s" shared with their larger-boilered developments of the "251" series the heavy main line traffic out of King's Cross. With the introduction of the "Pacifics," however, they were displaced from this work, and since then have been principally employed on the Cambridge trains and other less arduous duties.



Brisk Work by L.N.E.R. Mixed Traffic Engine

Of the many notable locomotive types of the late North Eastern Railway, the large three-cylinder 4–6–0 mixed traffic engines formerly known as class "S3," but now L.N.E.R. "B16," are among the most distinctive. Although their driving wheels are only 5 ft. 8 in. diameter, they have a good turn of speed and are often employed on express passenger trains. No. 1374 of this type made an excellent run with the heavy 12 noon London express from Hull, hauling a load of 360 tons tare and 385 tons full. On account of adverse signals it took 8 min. 53 sec. to pass Hessle, 4.8 miles, but then the engine went ahead in fine style, working up to a sustained 64½ m.p.h. on the level at Broomfleet. Speed was eased to 45 over the junctions at Staddlethorpe and then a maximum of 59 m.p.h. was recorded before stopping at Goole, 23.7 miles in 31¼ min., or about 30 minutes net. Staddlethorpe, 17 miles from Hull, had been passed in 20½ min.

On restarting, Thorne, 7½ miles, was passed in 10½ min. at 58½ m.p.h., after which speed rose to a sustained 60 m.p.h. at Barnby Dun. Signals were "on" approaching Doncaster, but in spite of this the 17¼-mile run was completed in 23 min. or about 22 minutes net.

We are indebted to Mr. O. S. Nock for these timings.

S.R. Place a Record Order

The S.R. are losing no time in proceeding with arrangements for the electrification of the Portsmouth main line. Preliminary works already commenced were mentioned in these pages last month, and the company have now placed the biggest order ever known in this country for railway electrification equipment. This includes the supply and erection of electrical machinery for 27 rectifier sub-stations.

More Old Engines Withdrawn

With the scrapping of Nos. 3416 and 3417, only No. 3420 remains in service of the old G.N. 0-8-0 type. This was the only one of the class to be rebuilt with a large boiler. The G.E. "D13" 4-4-0s are disappearing rapidly. They were converted from 2-4-0s many years ago.

Brighter Colours on British Railways

Mr. H. M. Madgwick informs us that one of the Brighton main line six-car electric train sets, No. 2015, has been painted a bright emerald green shade that presents a striking appearance, especially in bright sunlight, as compared with ordinary S.R. green. From Ireland we learn that the five large 4–4–0 compound locomotives of the G.N.R. are being specially finished in blue, lined black and white, with bright red frames lined similarly. A coat-of-arms appears on the splashers below the nameplate, a welcome return to the use of such heraldic devices in these days, when the tendency is to give them up altogether.

The illustration at the head of the page, reproduced by the courtesy of the Great Southern Railways of Ireland, shows a 4-4-0 locomotive of that line, as rebuilt and brought up to date. The locomotive seen in the lower photograph is one of those formerly employed on the S.R. narrow-gauge Lynton-Barnstaple line, and is now scrapped. Photograph by W. Vaughan-Jenkins, Bath.

In view of these experiments, and bearing in mind the special finish of the L.N.E.R. *"The Silver Jubilee"* train and its streamlined locomotives, it will be interesting to see whether brighter colours generally will come into use for railway stock. Already stations and other buildings are being dealt with in order to abolish the drab appearance that characterises many of them.

Further L.M.S.R. Shed Improvements

Nineteen important L.M.S.R. motive power depots are to be reorganised and brought up to date this year. Improved track layouts to aid the rapid handling of engines will be provided, also mechanical coaling plant and other facilities. The depots include Bedford, Goole, Perth, Kingmoor, Mold Junction, Normanton, Stafford, Camden, Huddersfield, and various Lancashire sheds.

Electrifying the Wirral Railway

The Mersey Electric Railway was opened in 1886 as a steam-operated line and recently celebrated its jubilee. Almost at the same time the decision of the L.M.S.R. to electrify the lines of the old Wirral Railway between West Kirby, New Brighton and Birkenhead Park was announced. As the Mersey and the Wirral systems join at Birkenhead Park, the running of through trains from the Wirral termini over the Mersey system to Liverpool, and vice versa, is to be made possible. These services will be shared by the existing Mersey stock and new three-coach articulated sets that are to be provided by the L.M.S.R.

The Mersey Railway use a fourth rail for the return current, but the L.M.S.R. have decided on a running rail return system. The stock of both companies is to be fitted with change-over switches to allow for this. At present Mersey Railway vehicles have no heating apparatus, in view of their running in tunnels for most of their journeys, but this is now being fitted in order to make them suitable for use on through trains.

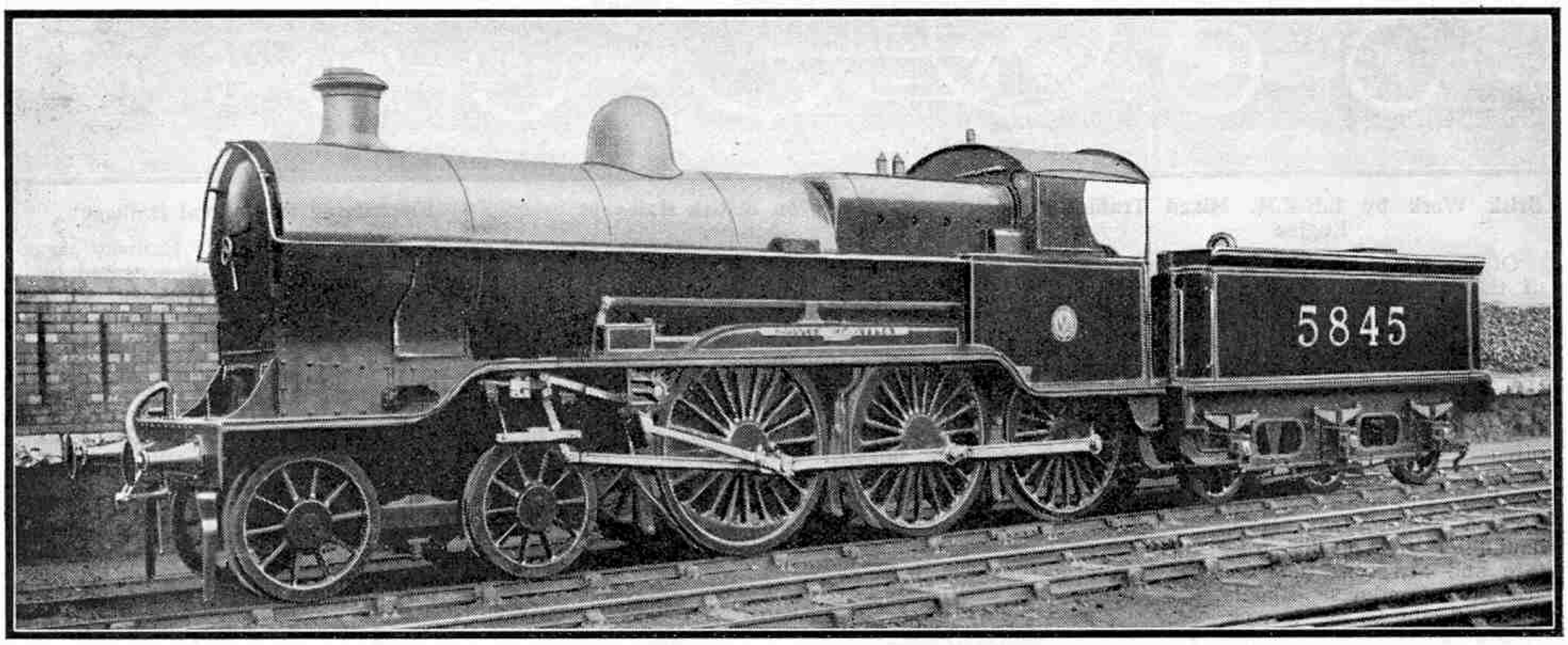
As a fitting celebration of their jubilee, the Mersey Railway have put into service several new trailer cars. These show a great improvement in comfort over the older vehicles and they are very handsome in appearance. The exteriors are finished with sheet steel panelling. With the introduction of these vehicles, six-car trains are being operated during the rush periods in place of the five-car units previously employed. Alterations at stations have been necessary to allow for this, especially at Liverpool (Central), where the tunnel and platform have been extended.

Luxury Stock for G.W.R. Main Lines

The end-vestibule system of construction that was a feature of the new *"Cornish Riviera Limited"* stock introduced last summer is to be applied to 124 new third-class coaches for use on all main line express services throughout the G.W.R. system. They will be of the side-corridor type with large windows affording an uninterrupted view on each side. The coaches will be built on steel underframes and finished externally with sheet steel panelling.

An Unusual Valve Gear Experiment

The "Walschaerts-Beames" Motion



The illustration shows the L.M.S.R. 4-6-0 locomotive formerly No. 5845 and now No. 25845, fitted with "Walschaerts-Beames" valve motion and temporarily named "Prince of Wales." Photograph by courtesy of the L.M.S.R.

FOR many years the use of inside cylinders in British locomotive practice was almost traditional, and the minimum of external working parts resulted in the invariable neatness of external appearance that characterised our engines for so long. Cylinders of the diameters necessary for the power output then required could be accommodated between the frames, and such designs were invariably steady in running. Another advantage, of special importance in the days before superheating, was that inside cylinders were protected from heat losses occasioned by condensation.

Even when outside cylinders were used, until the present century outside valve motions were rarely fitted, except on special designs. At the present time, the G.W.R. use inside valve gear exclusively for both two-cylinder and four-cylinder engines, and in this respect their practice differs from that of the other three groups.

An outside-cylinder locomotive with inside valve gear is quite usual, but the reverse practice sounds fantastic. There have actually been locomotives with inside cylinders and outside valve gear, however. These were seen on the Western Section of the L.M.S.R. This peculiar feature was not part of their original design. Each of the engines belonged to the "Prince of Wales" class of L.N.W.R. origin, and the modifications, which resulted in their "inside-out" appearance, took place since grouping.

The original L.N.W.R. "*Prince of Wales*" locomotive, No. 819, was turned out of Crewe Works in October 1911, and formed practically a superheated version of the 4–6–0 "Experiment" class then already in service. Larger cylinders with piston valves were fitted, in addition to the superheater, and the short smoke-box of the "Experiment" engines became an extended one in the "Prince of Wales" class; apart from their names and numbers this external difference formed practically the only means of distinguishing one class from another. Locomotive work even in those days was a strenuous business, and the "Princes," as they became known, certainly did their share. They were so generally useful, apart from main line express work, that in addition to those built at Crewe 20 were constructed in 1915 by the North British Locomotive Company Ltd., and after the War a further 90 were built by the famous firm of Wm. Beardmore and Company Ltd. At the time of the formation of the L.M.S.R. group the number of "Princes," both Crewe-built and otherwise, was 245.

The moderate length of the engines, together with the short coupled wheelbase, rendered them useful for service on parts of the line where bigger engines could not be run owing to turning difficulties. A "Prince" and tender can be accommodated on a 50 ft. turntable, and is as convenient in this respect as a 4–4–0 engine of ordinary size, such as a "Standard Compound." As the cylinders are inside, the connecting rods necessarily drive on the leading axle. As a result of the "bunched up" design, therefore, a fairly angular position is assumed by the rods when they are on the top or bottom centres respectively. Joy's valve gear is used, as in so many other engines of L.N.W.R. design, and a characteristic of this motion is that part of its movement is derived from the connecting rod itself. The rod is drilled approximately midway along its length in order to accommodate the pin on which the "jack links" are pivoted. This is a source of weakness under heavy stresses, and appears to have contributed to several connecting rod breakages sustained by engines of the class.

As a result of these mishaps the problem presenting itself to Mr. H. P. M. Beames, in charge at Crewe at the time, was how to do away with Joy's valve gear and so eliminate the objectionable pin hole in the connecting rod; and yet operate satisfactorily the piston valves situated above the cylinders. The interesting expedient therefore was adopted of providing an adaptation of Walschaerts valve gear operated from the coupling rod pins in the leading driving wheels, the necessary connections to the inside spindles being made by rocking levers. With respect to the return crank and movement of the expansion link, the valve gear fitted was normal. In order to reproduce the reciprocating motion of the crosshead, which is relied on for an important part of the movement of Walschaerts gear, it was necessary to provide on each side what we may term a dummy connecting rod, working off the leading coupling rod pin and connected at its forward end to the bottom of what is normally the combination lever. In order to clear the whole of the motion satisfactorily and to render it easy of access for oiling and inspection, the footplating of the engines thus altered was raised for a portion of its length.

The plan appears to have met with a certain amount of success, but the number of engines so fitted has never been more than five. Four of these were conversions from the existing "Princes": No. 5632, "*Bret Harte*," the first to be altered; No. 5672, "*Condor*"; No. 5688, "*Tara*"; and the nameless No. 5762. The other, now No. 25845, was built new in 1924 by Wm. Beardmore and Co. Ltd., and was exhibited at the British Empire Exhibition at Wembley in that year.

Building a Railway Footbridge

Erection Operations Without a Crane

By R. D. Gauld, M.Eng., A.M.Inst.C.E.

THE building of such a light structure as a footbridge over the railway presents no great difficulty in handling and placing the material, but gives scope for some scheming to get the work done with the least possible interference with traffic. For a steel footbridge, the usual method of construction would be to put the middle portion of the bridge in position by means of a crane travelling on the rails. The supports and staircases could probably be erected without a crane. Reinforced concrete footbridges have been built similarly, the various portions being cast in moulds in a depot previously, and brought to the site and put in place just like steelwork.

The important feature about the job we are going to describe is that the footbridge was built without the use of a crane. This was possible only on account of the type of design adopted, and could not be used for most designs. The reasons will be explained later. There had previously been a timber footbridge in the same position, but in the course of years the timber had deteriorated considerably, and during a hot, dry summer the timber became very full of cracks. Finally, sparks from an engine set it on fire, and although this was noticed and stopped before it got a good hold, the bridge had to be closed in the interests of safety. As the railway company were obliged to provide a footbridge at this place, a design for a steel one was rapidly put in hand.

While the steelwork was being made, the new concrete foundations were accurately set out and put in to correct spacing and levels. The holding down bolts which would afterwards secure the bridge were cast in the concrete, but were set in tubes, so that they had a bit of freedom in case of any slight discrepancies in the measurements. The steelwork was prepared by one of the contracting firms who specialise in this work, and was loaded up by them, after being carefully inspected to see that it agreed with the drawings.

As the week-day traffic under the bridge is fairly heavy, it was decided that the job would have to be done on a Sunday. A date was then fixed, such that the steelwork would be certain to be ready, and also so that no other jobs in the same neighbourhood on the same day would interfere with the work. An insertion was then made in what is called the "*Fortnightly Notices*," which gives a list of all engineering works on, over, near, and under the line, for the information of drivers and others. Sometimes a speed restriction would be necessary, and if so, this would be described. For the present job this was not necessary, and the Notice simply stated that, between stipulated times, the work would be in hand, "between trains." This means that trains are not interfered with, but at the same time drivers are expected to keep a specially sharp look-out. Arrangements were also made to have look-out men available to give warning of approaching traffic, and if necessary to stop trains by means of detonators and flags, this, of course, being in emergency only. These look-out men are generally platelayers from the length of line concerned, as they best know the local conditions.

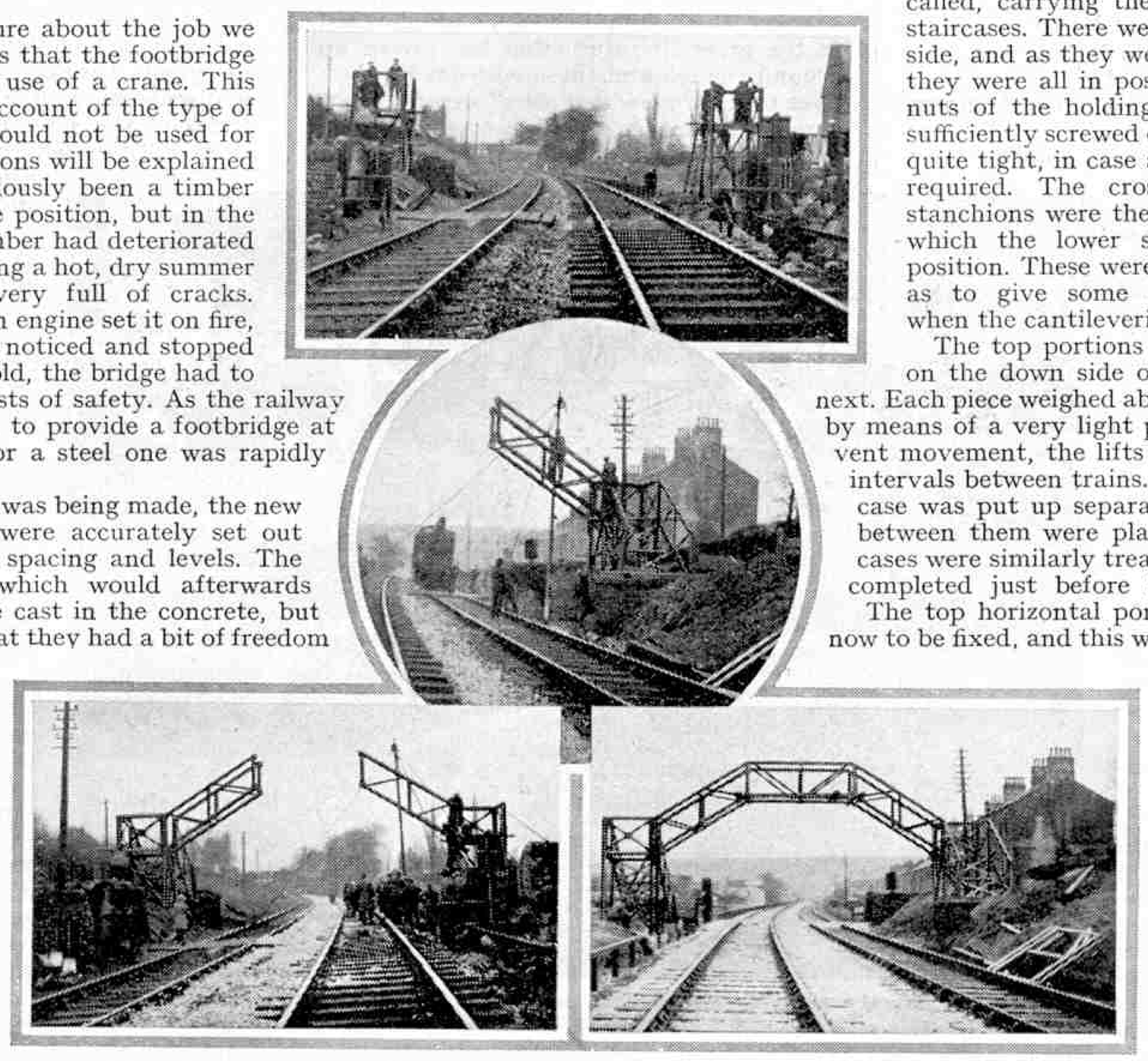
Every piece of steelwork for the bridge was given a distinguishing mark with white paint letters and figures before it left the works, the marks being recorded on a copy of the drawing of the structure. This ensured that all the pieces were correctly assembled at the site, so that the bridge fitted together just like a large-sized Meccano model.

The date and time being fixed, it only remained to arrange to get the material to the job. Luckily, on this occasion, an Engineer's ballast train was booked for the dumping of several wagons of ballast close by, so the two wagons containing the steelwork were sent out by the same train. It arrived at the site of the bridge at 7.55 a.m., and by 8.58 a.m. 12 men and a foreman had unloaded all the steelwork on to the side of the line, and the train went away.

The next step was to erect the columns, or stanchions, as they are called, carrying the lower landings of the staircases. There were four of these on each side, and as they were comparatively light, they were all in position by 9.45 a.m. The nuts of the holding down bolts were just sufficiently screwed down for safety, but not quite tight, in case a slight adjustment was required. The cross bracings for these stanchions were then bolted in place, after which the lower staircases were put in position. These were required to be fixed so as to give some anchorage to the job when the cantilevering started.

The top portions of the upper staircases on the down side of the line were tackled next. Each piece weighed about 6 cwt. and was lifted by means of a very light pole, well guyed to prevent movement, the lifts being made in suitable intervals between trains. Each side of the staircase was put up separately, then the bracings between them were placed. The up side staircases were similarly treated, the two sides being completed just before 3.0 p.m.

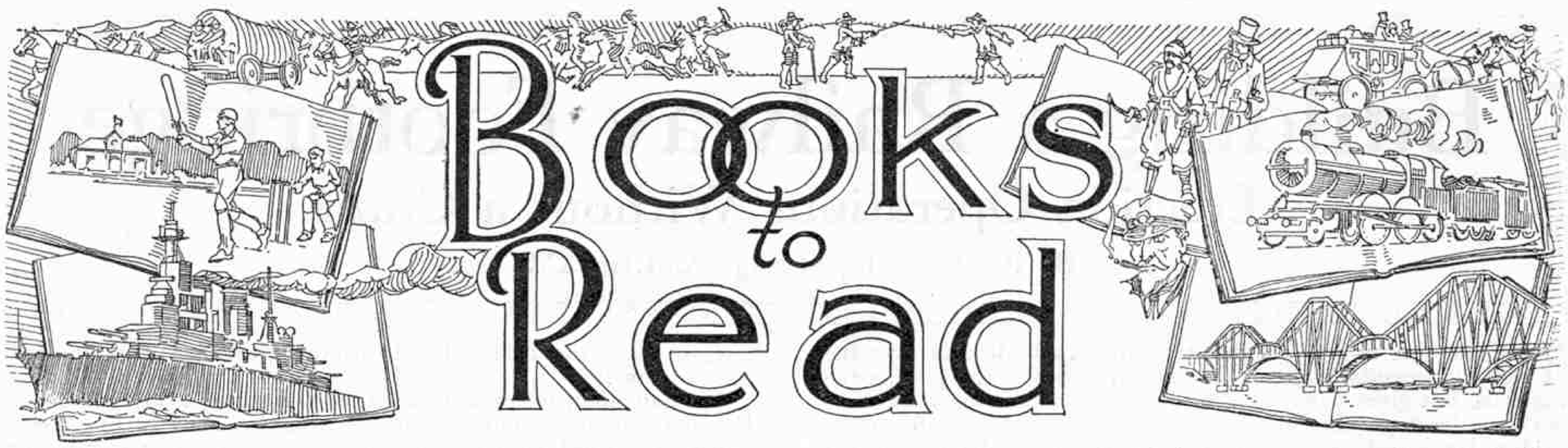
The top horizontal portion of the bridge had now to be fixed, and this was done bar by bar, two men standing on the cantilevered portions of the span, and lifting the pieces, which were quite light, by ropes. A little force was required to get the first bar in, as the unavoidable weight of the men on the cantilevered portions caused these to bend down slightly and so reduce the span. However, once the first bar was forced in, the remainder went easily. The main holding down bolts were now screwed down tightly, the bases of the stanchions afterwards being cased in with concrete. By 4.20 p.m. all the essential portions of the steelwork to enable the bridge to stand safely on its own had been fixed, which completed the work for that Sunday.



Various stages in the building of a footbridge, from the erection of the stanchions to the completion of the span. This was performed without the aid of a crane, as described in this article.

On the following days, one or two additional bracings were fixed, also the timber stair treads and the timber deck of the top part of the bridge. The handrails were then put in position, and wire netting was fixed to the insides of the girders to close the large spaces between the parts of the girders. Steel smoke-plates were fastened under the bridge, above each set of rails, to take the blast from the engines and prevent it from damaging the steelwork. Renewing smoke-plates is a much cheaper job than repairing bridge steelwork that has been damaged by blast action.

It will be noticed that in this footbridge the staircases are each in two portions, the top portion on each side turning square to the bottom portion. This has the effect of greatly reducing the length of the top horizontal part, which may then be considered to be a span carried by two cantilevers. It is for this reason that it is possible to adopt the erection method described.



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"The Good New Days"

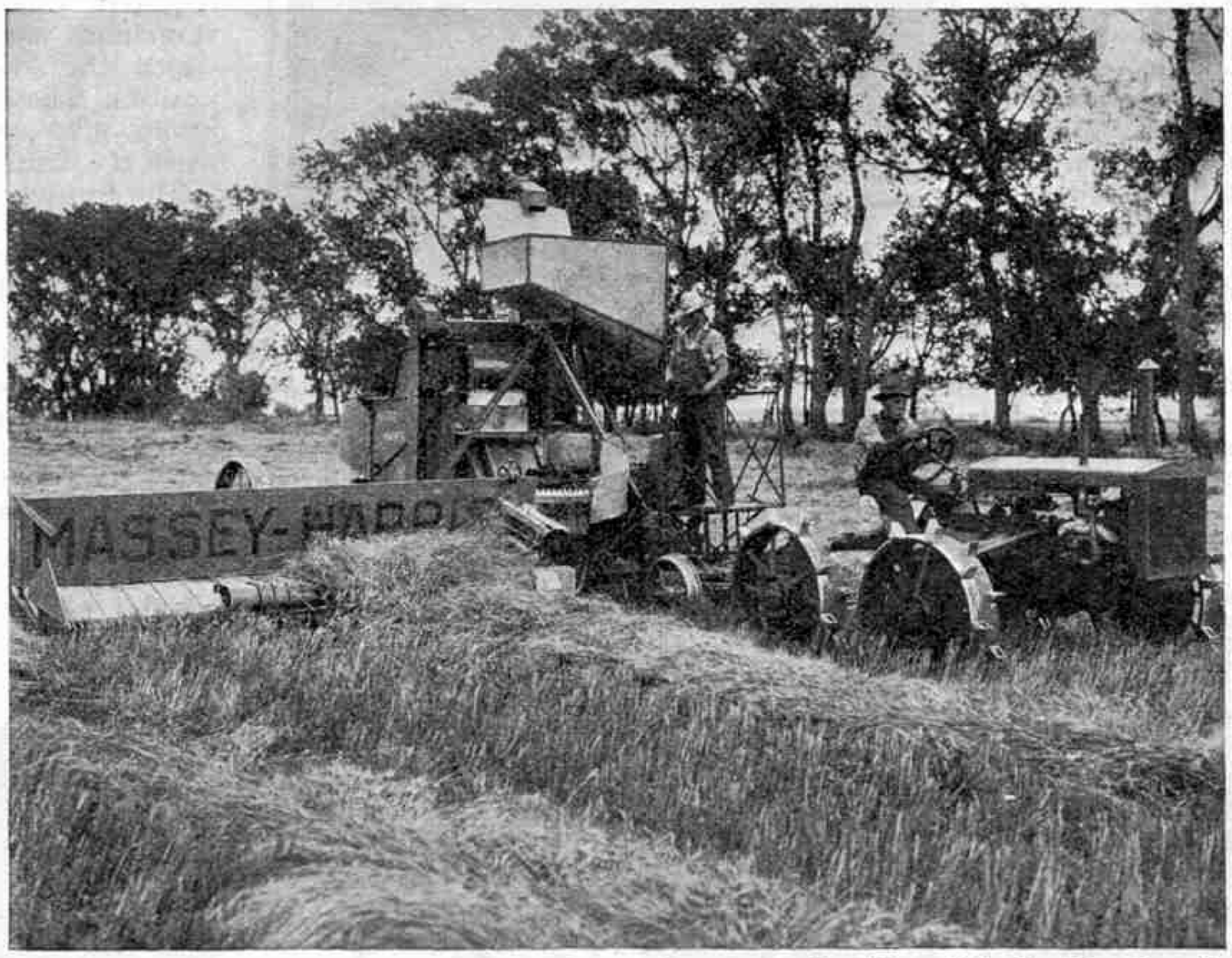
By MARJORIE and C. H. B. QUENNELL
(Batsford. 6/- net)

The authors of this book are well known for their excellent stories of life in bygone England. In the present volume they deal with the life of to-day, and try to show us how we can progress towards the "Good New Days" that we hope are ahead of us.

They first turn their attention to modern farming, which presents strange contrasts with that of only a few generations ago. Then most of the work was done by hand, but to-day combine harvesters and other machines have transformed the industry, and the coming of the Grid promises to bring electricity within the reach of practically all farmers, even though they live in remote parts of the country. The growth of machinery in ordinary industry is no less remarkable. It has resulted in the introduction of the modern system of mass production. The authors rightly point out defects of the system, but its advantages are so obvious that there is little doubt it will extend, bringing with it greatly increased production, and improved prospects of better times for everybody.

An interesting section deals with speed and power, and contrasts the slow and uncomfortable coach journeys of 100 years ago with the speedier and more comfortable ways of travel available to-day. The aeroplane of course is responsible for our greatest advances in this respect. It seems likely that even speedier communication will become possible in future, for pioneers are still at work setting up new records for long distance flights, the latest example being the trip to South Africa and back made by Flight Lieut. T. Rose, who on the outward journey reduced the record by more than half a day.

The book is written throughout in the usual easy and familiar style of the Quennells, and is amply illustrated by 101 excellent photographs.



A combine harvester at work, cutting and threshing corn in one operation. (From "The Good New Days," reviewed on this page.)

"In Great Waters"

By Capt. S. G. S. MCNEIL

"Sea-Toll of Our Time"

By R. L. HADFIELD
(Philip Allan and Co. Ltd. Each 2/6 net)

These books are included in the Nautilus Library, the volumes of which are devoted to the great literature that has grown up around the sea and those who devote their lives to it. "*In Great Waters*" describes the career of its author, who began as an apprentice in a sailing ship and had experience in vessels of various kinds before finally joining the Cunard Company, in which he rose to the rank of Captain. His life has been full of excitement, and at times danger, and he shows remarkable ability in telling stories of his experiences. A particularly attractive section of the book is taken up with the author's work during the War, when he was in command of mine sweepers during the Gallipoli operations. His stories of the "*Lusitania*" and the "*Mauretania*" also are fascinating, and it is interesting to learn his opinion that the "*Mauretania*" was not faster than the "*Lusitania.*" Capt. McNeil had a great affection for the "*Mauretania,*" of which he was in command for many years; and he ends his book with an account of her narrow escape from collision when nearing Southampton on his last voyage, a catastrophe that was only averted by his own quick grasp of a dangerous situation.

"*Sea-Toll of Our Time*" tells the stories of 24 famous sea tragedies, beginning with the wreck of the P. and O. liner "*Aden,*" lost in 1897 on a reef off the island of Sokotra in a great storm, and ending with the sinking of the "*Vestris*" in the Atlantic Ocean in 1928. The remaining chapters deal with fire at sea, collision, stranding and other causes of great wrecks, and among them is a discussion of one of the greatest mysteries of the sea, the total disappearance of the "*Waratah*" after leaving Durban. Every story is thrilling, and the book will be read with eager interest as a record of heroism in difficult and dangerous circumstances, whether in a doomed vessel, in open boats after a catastrophe, or cast away on barren reefs or lonely islands.

"Workshop Practice"

By F. JOHNSTON TAYLOR
(Technical Press Ltd. 16/- net)

The practical part of an engineering training can only be taught thoroughly in the workshop, but it is necessary to learn as much as possible of the principles on which it is based, and the purpose of the present volume is to supply this information to young engineers. Measurements, measuring machines and tools, and gauges and gauge systems are dealt with first, and are followed by sections on common workshop tools, bench work and the materials in which the engineer works. The rest of the book is devoted to detailed descriptions of lathes and their accessories, and of the many types of machine now so largely used in engineering workshops. Chapters on drop forging and stamping, and on welding complete this excellent book, which is copiously illustrated.

"Tool Making for the Craft Room"

By C. HOWELL. (Pitman. 2/-)

In the past beginners in handicrafts have spent much of their time making comparatively useless articles. Mr. Howell believes it is better to make some of the simple tools they need, and for their benefit gives working instructions and drawings, with descriptions of the materials used and the operations involved. A glossary is provided, and additional illustrations show actual tools made by the author's students.

"Junkers and World Aviation"

By Capt. F. A. Fischer v. Poturzyn

This book has been produced to describe and illustrate the work carried on by the well-known Junkers aircraft manufacturing firm. It is an enlarged version of its German original, translated into English by Mr. E. Morley, and we understand that it is being distributed in this country by W. H. Smith and Son Ltd., Strand House, Portugal Street, London, W.2.

In a sense the book may be described as the history of aviation in Germany, for it begins with the pioneer efforts of Hugo Junkers, the founder of the firm, who was at work on problems connected with flight in the early years of the century, and patented the all-wing aeroplane in 1910. This is followed by accounts of the developments that took place during the Great War, when metal construction was introduced, and the progress that was made immediately afterwards, in spite of difficulties imposed on German aviation by the restrictions then in force. Next comes a particularly interesting discussion of the growth of the Junkers system of construction up to the appearance of the Junkers G38, the nearest approach to the all-wing monoplane that has yet been produced. The section ends with a description of the growth of the network of air lines in Central Europe.

The manner in which Junkers aircraft and engines are built is next dealt with. The factories in which this work is carried out have been very carefully designed and laid out to facilitate production, and many tools and testing appliances have been developed in the works themselves in order to suit special requirements. Finally we are told something of the work that is being carried on in all parts of the world with the aid of Junkers machines.

A remarkable feature of the book is the very large number of photographic illustrations of Junkers machines, and of the factory operations by which they are produced. There are no fewer than 62 full-sized plates, many of them including several photographs, and all of very high standard. At the end of the book is a useful section giving photographs and dimensional details of Junkers aero engines and aeroplanes. All who are interested in the development of the aeroplane will find the book of absorbing interest as a record of a firm that has made great contributions to aviation.

A word must be added about the excellent manner in which the translation of the book has been effected. The English version is a faithful rendering of the German text, with correct equivalents for technical terms; and at the same time it has all the merits of a well-written original.

A Junkers Ju 52/3m monoplane. (From "Junkers and World Aviation," reviewed on this page.)

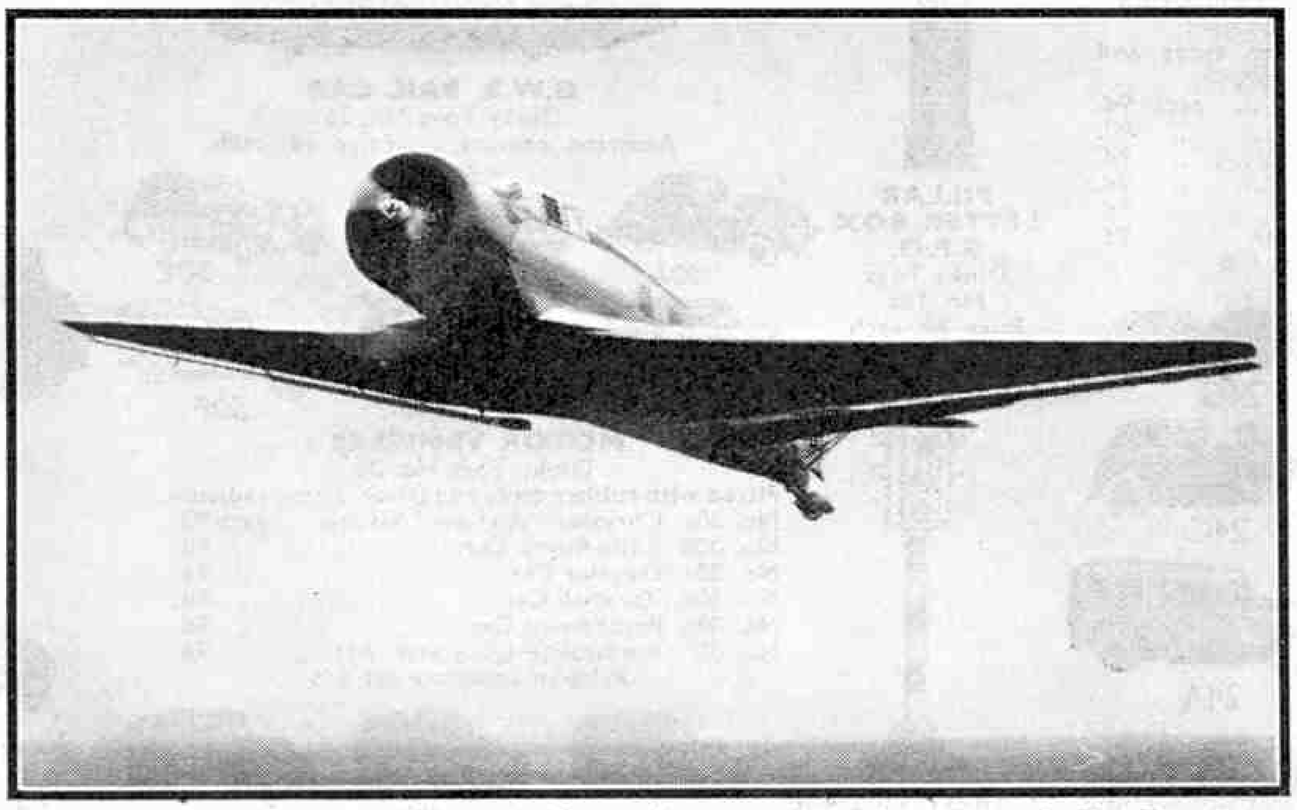
"Sea Scouting and Seamanship for Boys"

By W. Baden-Powell, K.C.
(Brown, Son and Ferguson Ltd. 2/- net)

In a foreword to this book, the Chief Scout informs us that it was written by his brother, under whom he began his own Scouting as a Sea Scout. The author was both a sailor and a boy at heart, and these qualities are reflected in his story of Sea Scouting, for he recognises the need for accurate knowledge of ships, boats and the sea, while remembering that the headquarters of the Sea Scouts can be made up into a jolly waterside camp.

The book is packed full of interesting and exciting information of all kinds. It begins with stories of sea scouting in olden times, and then follow descriptions of various types of ships and boats and directions for handling them in all circumstances. The treatment is very practical and thorough, and the lessons the author has to teach are driven home by means of stories drawn from his own experience. Swimming and rescue work, bends, knots, splices and tackles, and buoys and beacons are dealt with in the final chapters.

Although written for Sea Scouts, and admirably adapted to cover all their needs, the book will be of the greatest value to owners of small yachts and boats who are in need of a practical guide. It is well illustrated by drawings referring to features of importance in the text, and includes coloured plates of flags and buoys.



Junkers Ju 160 Express Air Liner in flight, with the undercarriage retracted. (See above).

"Rockets Through Space"

By P. E. Cleator
(George Allen and Unwin Ltd. 7/6 net)

Now that the use of aeroplanes has made the Earth appear so small to us, it is perhaps only natural that we should begin to look forward to the day when we can travel farther afield to the Moon, or even to Mars and more distant planets. How journeys in space may be accomplished is the subject of this exciting book, which is written by a pioneer in the consideration of the problems of space travel.

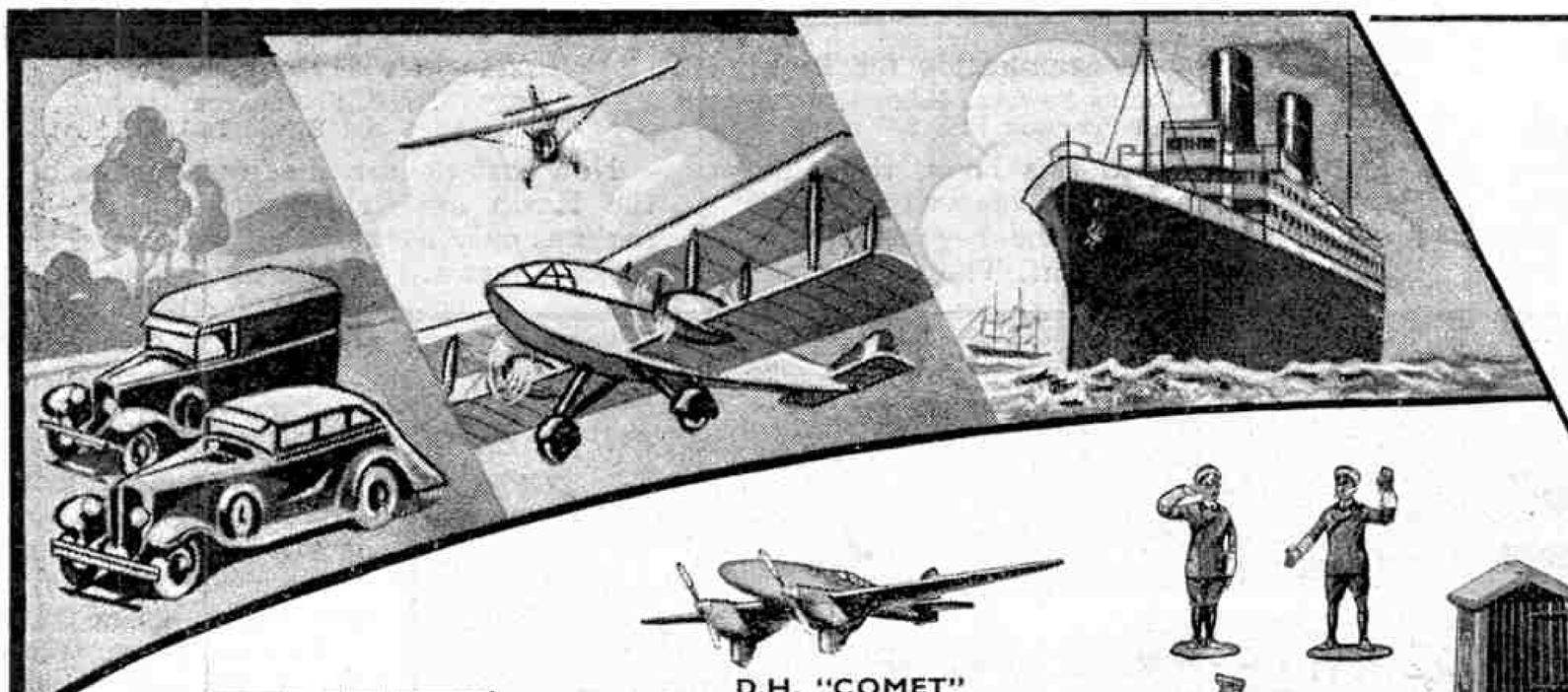
The necessary power for a journey through space can only be applied by means of rockets, which are the only power units capable of acting in empty space, and Mr. Cleator traces the development of the rocket from a mere firework into the rocket motor of to-day. This has not achieved any great results, and indeed its design is as yet the subject of pioneer experiments. The author tells the story of what has been done so far, and describes a theoretical rocket ship in which four people could be projected into space and brought back again. This would weigh 40,960 tons and cost £20,000,000.

The possible dangers of journeying through space are not overlooked by Mr. Cleator, who early takes occasion to remark that a safe return from an interplanetary voyage is highly desirable! He considers the risks of being frozen by the intense cold of outer space, of being roasted by the rays of the Sun, and of being shattered by collisions with meteorites, and in all cases shows very ably that the danger is either remote or can be avoided.

In spite of obvious difficulties, all of which are fairly stated, he is convinced that space travel one day will be possible, and if, as Professor A. M. Low suggests in his introduction, "it seems best to prepare ourselves for the delightful thought that interplanetary communication, or even travel, is not wildly impossible," no better way could be found than by reading his book. Photographs and diagrams of rocket motors that have already been constructed, and interesting drawings illustrating the chief features of the author's arguments.

"A Record of the Scientific Work of John Tyndall"

We have received from Mr. H. Young, M.R.I., 16, Causton Road, London, N.6, a copy of a record of the scientific work of John Tyndall, F.R.S., the famous physicist. This record, which should be of great value to students of science, librarians and secretaries of scientific societies and others, has been printed at the Chiswick Press for private circulation. Copies may be obtained from Mr. Young at the cost of 5/- each.



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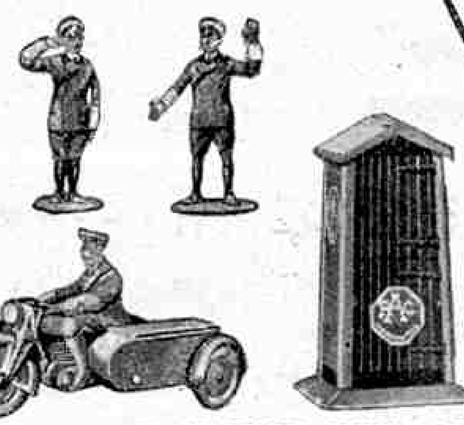
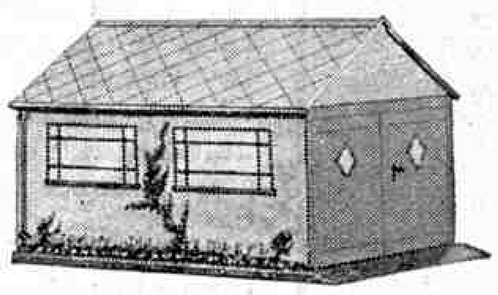
D.H. "COMET" AEROPLANE
Dinky Toys No. 60g
Scale model of plane used by C. W. A. Scott and T. C. Black in their Australian flight.
Price 6d. each



R.A.C. HUT, MOTOR CYCLE PATROL AND GUIDES
Dinky Toys No. 43
This set is representative of the familiar personnel and road hut of the R.A.C. Each item is finished in correct colours.

No. 43a	R.A.C. Hut	each	6d.
No. 43b	R.A.C. Motor Cycle Patrol	,,	9d.
No. 43c	R.A.C. Guide directing traffic	,,	3d.
No. 43d	R.A.C. Guide at the salute ...	,,	3d.

Price of complete set 1/9



GARAGE
Dinky Toys No. 45
Fitted with opening double doors. Will accommodate any two Dinky Toy Motor Cars.
Price 1/6 each

STREAMLINE SALOON
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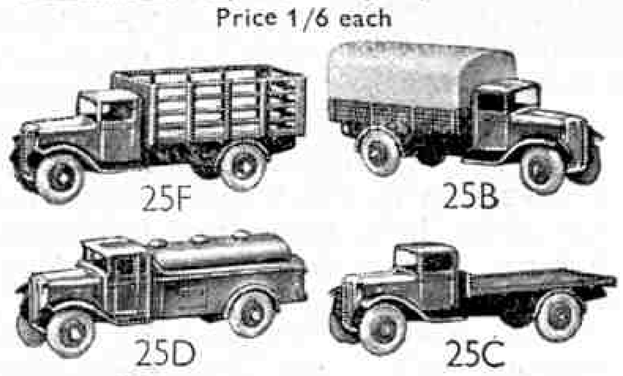
Assorted colours. Fitted with rubber tyres.
Price 6d. each



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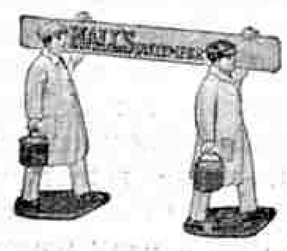
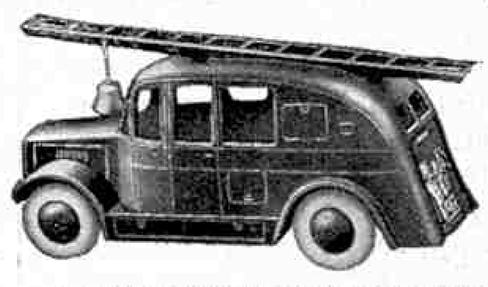
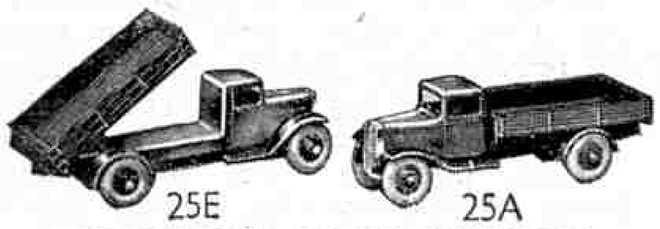
Dinky Toys No. 25g
For use with Dinky Toys No. 25 (Commercial Motor Vehicles.) Fitted with rubber tyres.
Price 7d. each



HALL'S DISTEMPER ADVERTISEMENT
Dinky Toys No. 13
This miniature of a well-known lineside advertisement is intended to be placed in the fields adjoining the railway track. Price 9d. each



STREAMLINE FIRE ENGINE
Dinky Toys No. 25h
Price 9d. each



COMMERCIAL MOTOR VEHICLES
Dinky Toys No. 25
Fitted with detachable rubber tyres and silver-plated radiators

No. 25a	Wagon	each	9d.
No. 25b	Covered Van	,,	9d.
No. 25c	Flat Truck	,,	9d.
No. 25d	Petrol Tank Wagon ...	,,	9d.
No. 25e	Tipping Wagon ...	,,	9d.
No. 25f	Market Gardener's Van	,,	9d.

Price of complete set 4/6

PILLAR LETTER BOX G.P.O.
Dinky Toys No. 12a
Price 3d. each

TANK
Dinky Toys No. 22f
Price 9d. each

MOTOR TRUCK
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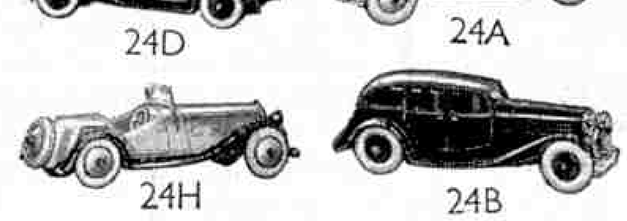
Assorted colours. Fitted with detachable rubber tyres. Price 6d. each



MOTOR CARS
Dinky Toys No. 24
Fitted with detachable rubber tyres and silver-plated radiators

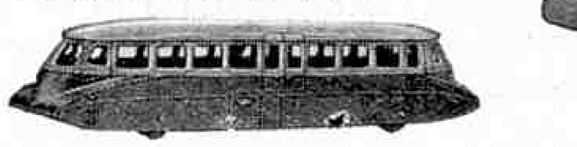
No. 24a	Ambulance	each	9d.
No. 24b	Limousine	,,	9d.
No. 24c	Town Sedan	,,	9d.
No. 24d	Vogue Saloon	,,	9d.
No. 24e	Super Streamline Saloon	,,	9d.
No. 24f	Sportsman's Coupé ...	,,	9d.
No. 24g	Sports Tourer (4 seater)	,,	9d.
No. 24h	Sports Tourer (2 seater)	,,	9d.

Price of complete set 6/–

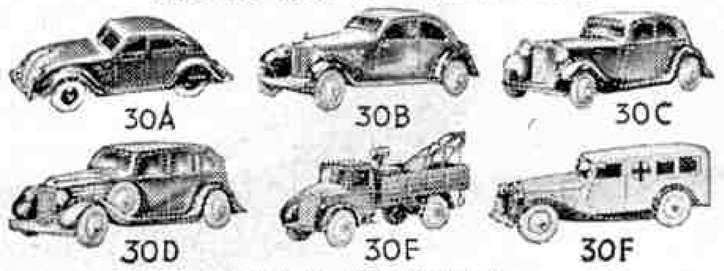
ROBOT TRAFFIC SIGNAL
Dinky Toys No. 47a
(Four-face)
Price 3d. each

ROBOT TRAFFIC SIGNAL
Dinky Toys No. 47b
(Three-face)
Price 3d. each

ROBOT TRAFFIC SIGNAL
Dinky Toys No. 47c
(Two-face)
Right-angle or Back-to-back.
Price 3d. each



G.W.R. RAIL CAR
Dinky Toys No. 26
Assorted colours. Price 4d. each



MOTOR VEHICLES
Dinky Toys No. 30
Fitted with rubber tyres and silver-plated radiator

No. 30a	Chrysler "Airflow" Saloon	each	9d.
No. 30b	Rolls-Royce Car	,,	9d.
No. 30c	Daimler Car	,,	9d.
No. 30d	Vauxhall Car	,,	9d.
No. 30e	Breakdown Car	,,	9d.
No. 30f	Ambulance (grey and red) ...	,,	9d.

Price of complete set 4/6

DELIVERY VANS
Dinky Toys No. 28/1

No. 28a	Golden Shred Van ...	each	6d.
No. 28b	Seccotine Van	,,	6d.
No. 28c	Manchester Guardian Van	,,	6d.
No. 28e	Firestone Tyres Van ...	,,	6d.
No. 28f	Palethorpe's Sausage Van	,,	6d.
No. 28n	Atco Lawn Mowers Van	,,	6d.

Price of complete set 3/–

TRAM CAR
Dinky Toys No. 27
Assorted colours.
Price 3d. each

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Dinky Toys No. 60.
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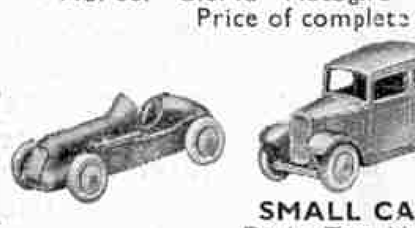
No. 60b D.H. "Leopard Mot
No. 60c Percival "Gull"
No. 60d Low Wing Monopla
No. 60e General "Monospar
No. 60f Cierva "Autogiro"
Price of complete



SMALL CA
Dinky Toys No

No. 35a	Saloon Car ...	
No. 35b	Racer... ...	
No. 35c	"M.G." Sports Car	

Price of complete

RACING CAR
Dinky Toys No. 23a
Assorted colours. Fitted with detachable rubber tyres. Price 4d. each

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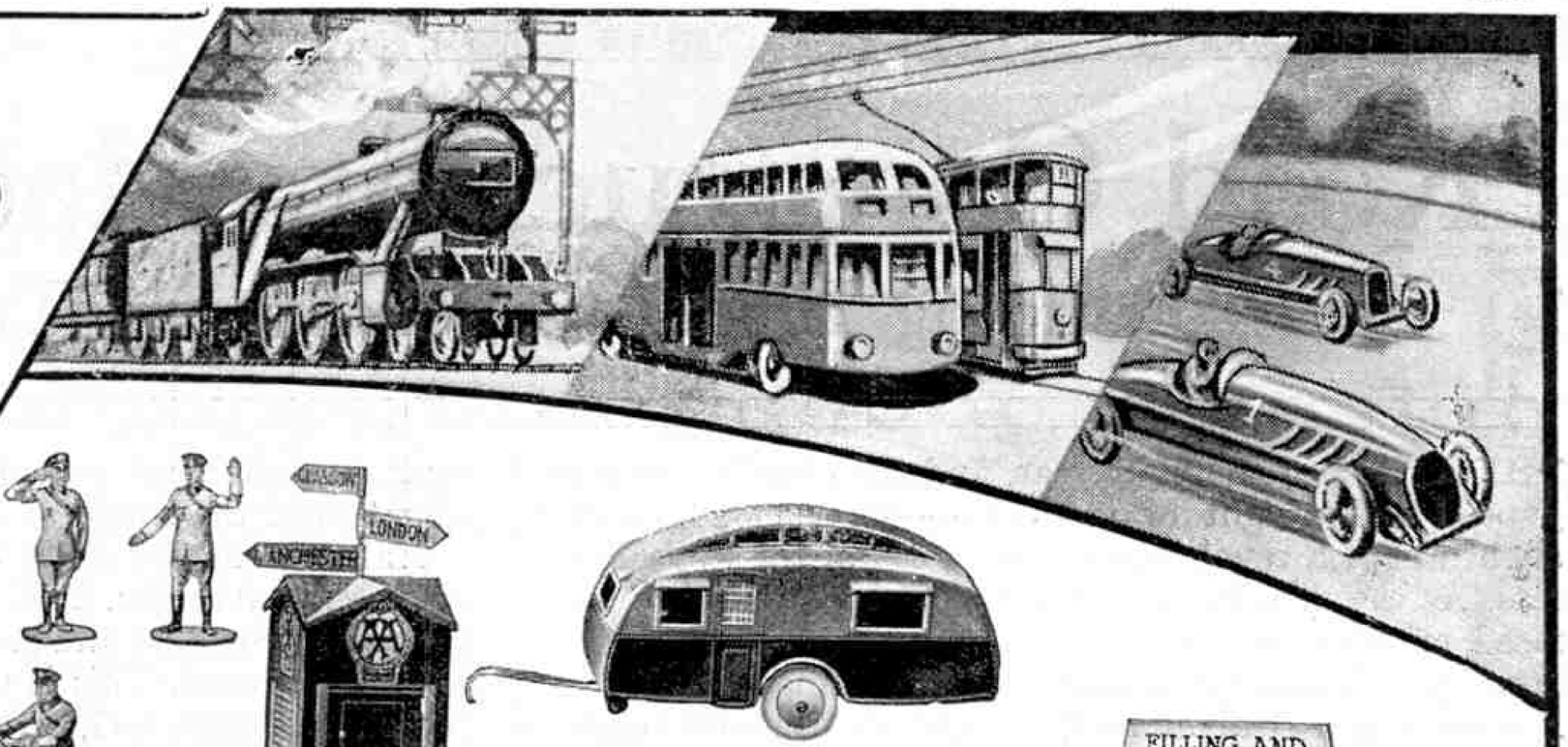

A.A. HUT, MOTOR CYCLE PATROL AND GUIDES
Dinky Toys No. 44
Collectors of Dinky Toys will find this new addition to the range of particular interest. Each item is finished in correct colours.

No. 44a	A.A. Hut	each	8d.
No. 44b	A.A. Motor Cycle Patrol ...	,,	9d.
No. 44c	A.A. Guide directing traffic	,,	3d.
No. 44d	A.A. Guide at the salute ...	,,	3d.

Price of complete set 1/11

CARAVAN TRAILER
Dinky Toys No. 30g
For use with the Saloon Cars in Dinky Toys Nos. 24 and 30
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Dinky Toys No. 22g
Assorted colours. Fitted with rubber tyres.
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PETROL STATION
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Accurate reproduction of a filling station. Tastefully printed in appropriate colours.
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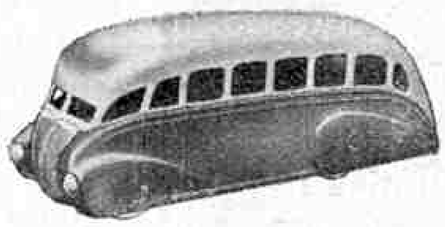
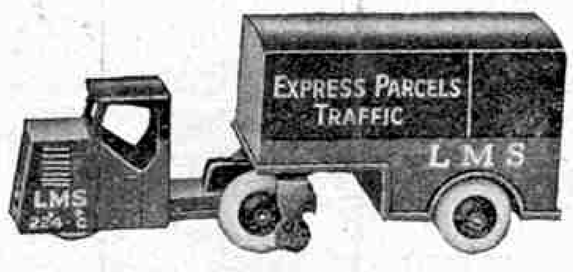
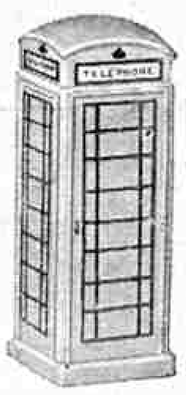


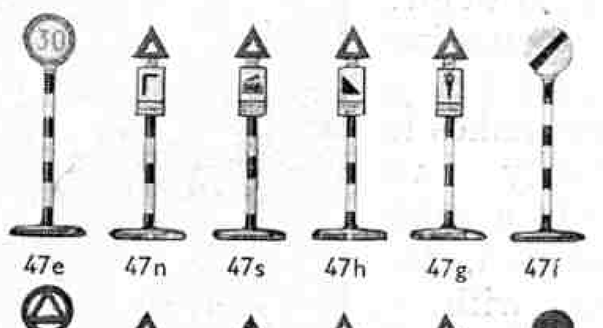
STREAMLINE BUS
Dinky Toys No. 29b
Price 6d. each



RAILWAY MECHANICAL HORSE AND TRAILER VAN
Dinky Toys No. 33R
Price complete, L.M.S.R., L.N.E.R., G.W.R. or S.R., 1/5



TELEPHONE CALL BOX
Dinky Toys No. 12c
Price 4d. each



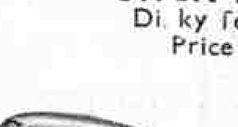
47e 47n 47s 47h 47g 47f

47r 47m 47k 47p 47t 47q

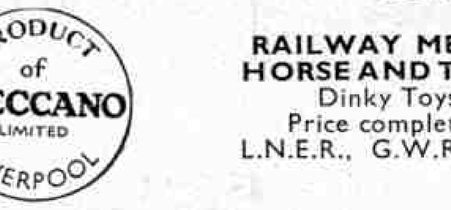
ROAD SIGNS
Dinky Toys No. 47

No. 47e	"30 Mile Limit" Sign ...	2 for	3d.
No. 47f	"De-restriction" Sign ...	,,	3d.
No. 47g	"School" Sign	,,	3d.
No. 47h	"Steep Hill" Sign ...	,,	3d.
No. 47k	"Bend" Sign	,,	3d.
No. 47m	Left-hand "Corner" Sign	,,	3d.
No. 47n	Right-hand "Corner" Sign	,,	3d.
No. 47p	"Road Junction" Sign ...	,,	3d.
No. 47q	"No Entry" Sign ...	,,	3d.
No. 47r	"Major Road Ahead" Sign	,,	3d.
No. 47s	"Crossing, No Gates" Sign	,,	3d.
No. 47t	"Round-About" Sign ...	,,	3d.

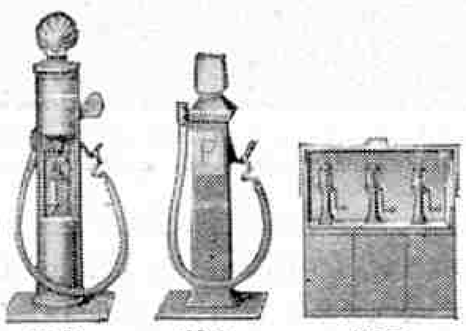
Price of complete set of twelve 1/6



HOTCHKISS RACING CAR
Dinky Toys No. 23b
Assorted colours. Fitted with rubber tyres. Price 6d. each



TRACTOR
Dinky Toys No. 22e
Price 9d. each



MOTOR BUS
Dinky Toys No. 29a
Assorted colours
Price 4d. each

49D 49A 49E 49B 49C

PETROL PUMPS
Dinky Toys No. 49
Scale models fitted with rubber hose pipes. Finished in correct colours.

No. 49a	Bowser Pump	each	4d.
No. 49b	Wayne Pump	,,	4d.
No. 49c	Theo Pump	,,	4d.
No. 49d	Shell Pump	,,	4d.
No. 49e	Oil Bin (Pratts)	,,	3d.

Price of complete set 1/5

PILLAR LETTER BOX AIR MAIL
Dinky Toys No. 12b
Price 3d. each

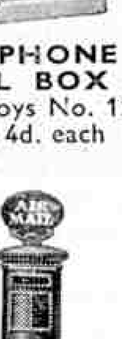
28G 28M 28P

28K 28D 28H

DELIVERY VANS
Dinky Toys No. 28/2

No. 28d	Oxo Van	each	6d.
No. 28g	Kodak Cameras' Van ...	,,	6d.
No. 28h	Dunlop Tyres Van	,,	6d.
No. 28k	Marsh and Baxter's Sausage Van	,,	6d.
No. 28m	Wakefield's Castrol Oil Van	,,	6d.
No. 28p	Crawford's Biscuit Van ...	,,	6d.

Price of complete set 3/–



BEACON
Dinky Toys No. 47d
(Realistic models of the Belisha Safety Beacons).
Price 1d. each

33A 33C 33F

33E 33B 33D

MECHANICAL HORSE AND FIVE ASSORTED TRAILERS
Dinky Toys No. 33
Fitted with rubber tyres

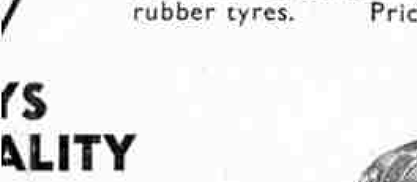
No. 33a	Mechanical Horse ...	each	6d.
No. 33b	Flat Truck	,,	6d.
No. 33c	Open Wagon	,,	6d.
No. 33d	Box Van	,,	8d.
No. 33e	Dust Wagon	,,	8d.
No. 33f	Petrol Tank	,,	8d.

Price of complete set 3/5

AEROPLANES

...ways Liner	...	each	9d.
...ard Moth"	...	,,	6d.
...ull" ...	...	,,	6d.
...Monoplane	...	,,	6d.
...onospar"	...	,,	6d.
...togiro"	...	,,	6d.

...mplete set 3/–



...LL CARS
...Toys No. 35

...	... ...	each	3d.
...	... ...	,,	3d.
...rts Car	...	,,	3d.

...mplete set 9d.

PRODUCT of MECCANO LIMITED LIVERPOOL

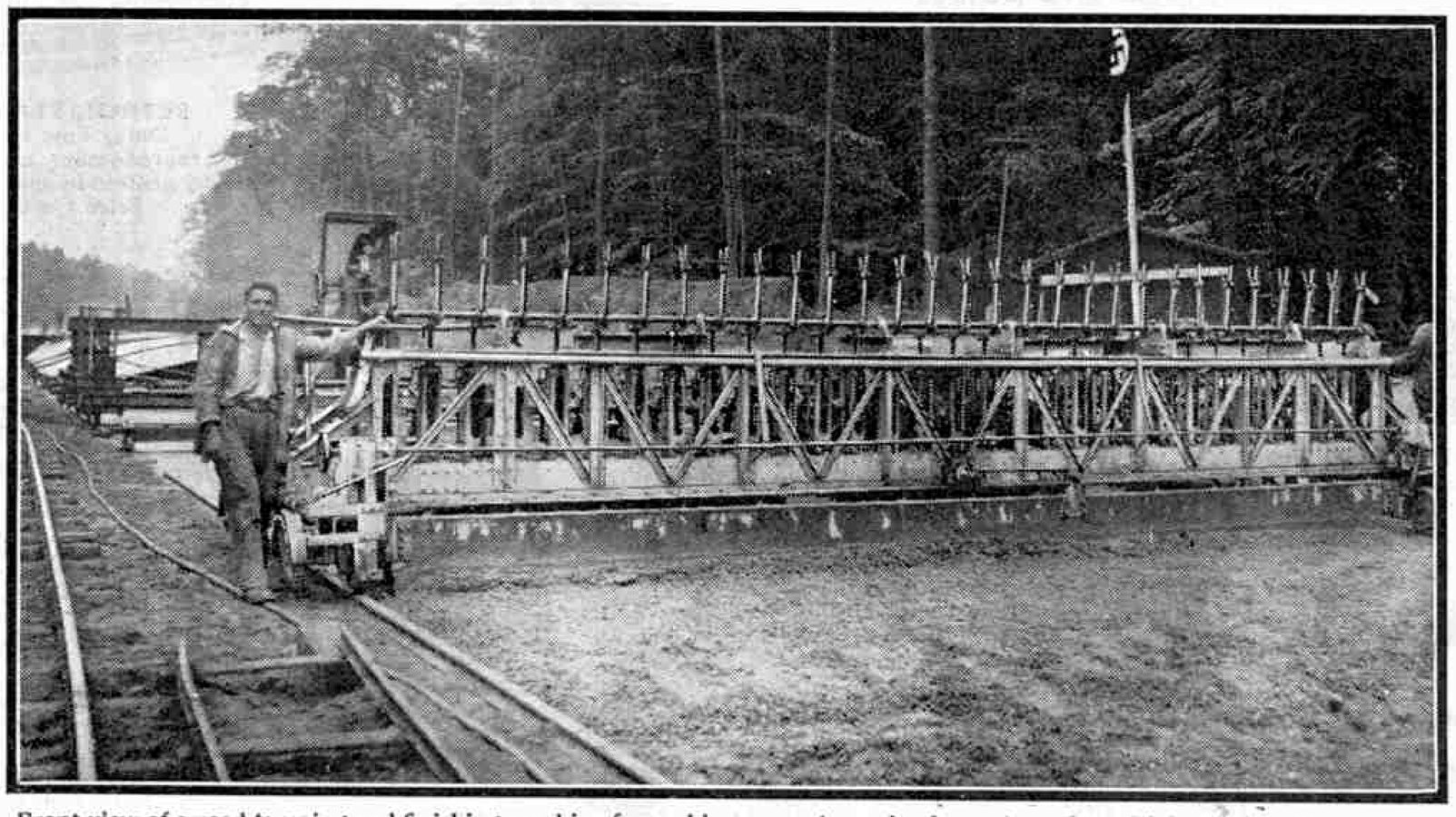
...D., LIVERPOOL 13

Road Construction Machinery

Building Highways for Speedy Traffic

THE coming of the motor car, and the ever-increasing speed and weight of modern motor vehicles, have brought about a revolution in our ideas of road requirements. As the density of traffic on our highways has increased, efforts have been made to cope with the new conditions by widening the existing roads, cutting off dangerous corners and straightening out curves. By-pass roads also have been constructed in order to avoid delays due to the difficulties of negotiating the crowded streets of busy towns and cities. Even these steps have proved insufficient and the construction of new roads has become urgently necessary.

Improvements also have been made in the material of which roads are constructed. The pounding effect of heavy lorries makes it necessary to provide a solid foundation, together with a surface that withstands the wear and tear of continual use, and does not break up, with the formation of pot-holes and cracks into which water can penetrate. Among the materials used for this purpose are tar macadam, asphalt and concrete.



Front view of a road tamping and finishing machine for making concrete roads of any strength or thickness. The illustrations to this article are reproduced by courtesy of Dingler'sche Maschinenfabrik A-G, Zweibrücken.

It will be realised that the construction of adequate roads is a serious problem for the engineer. He must not only consider their actual building, but also must pay attention to the shape of the surface. High crowns must be avoided as far as possible. Excessive slope towards the edges is no longer necessary, since water runs more easily off the prepared road surfaces of to-day than it did off the macadamised roads in use before the motor car became common. Banking also must be provided on the outer edge of curves in order to allow high average speeds to be employed with safety.

The growing use of concrete in making roads is an interesting development, and this material has been used in the construction of famous motor tracks, including that at Brooklands, and of roads for high speed motor traffic in European countries and also in the United States. The first step in making a concrete road is to mix the required proportions of Portland cement, gravel or broken stone, and sand with the necessary water. This is done in a machine and the resulting concrete is placed in position on the prepared foundation of the road and tamped firmly by means of hand rammers to force out the air between its particles. A wooden board placed on edge is then run over the concrete to smooth it down, and is worked about until the shape or profile is satisfactory.

Making concrete roads by this method is comparatively slow and laborious, and a machine that automatically tamps the concrete and gives it the correct profile has now been introduced. This is constructed by the Dingler'sche Maschinenfabrik A-G, Zweibrücken, a German engineering firm. It is available in several sizes to give road surfaces of various widths and can be adapted to the construction of tar macadam roads as well as those of concrete.

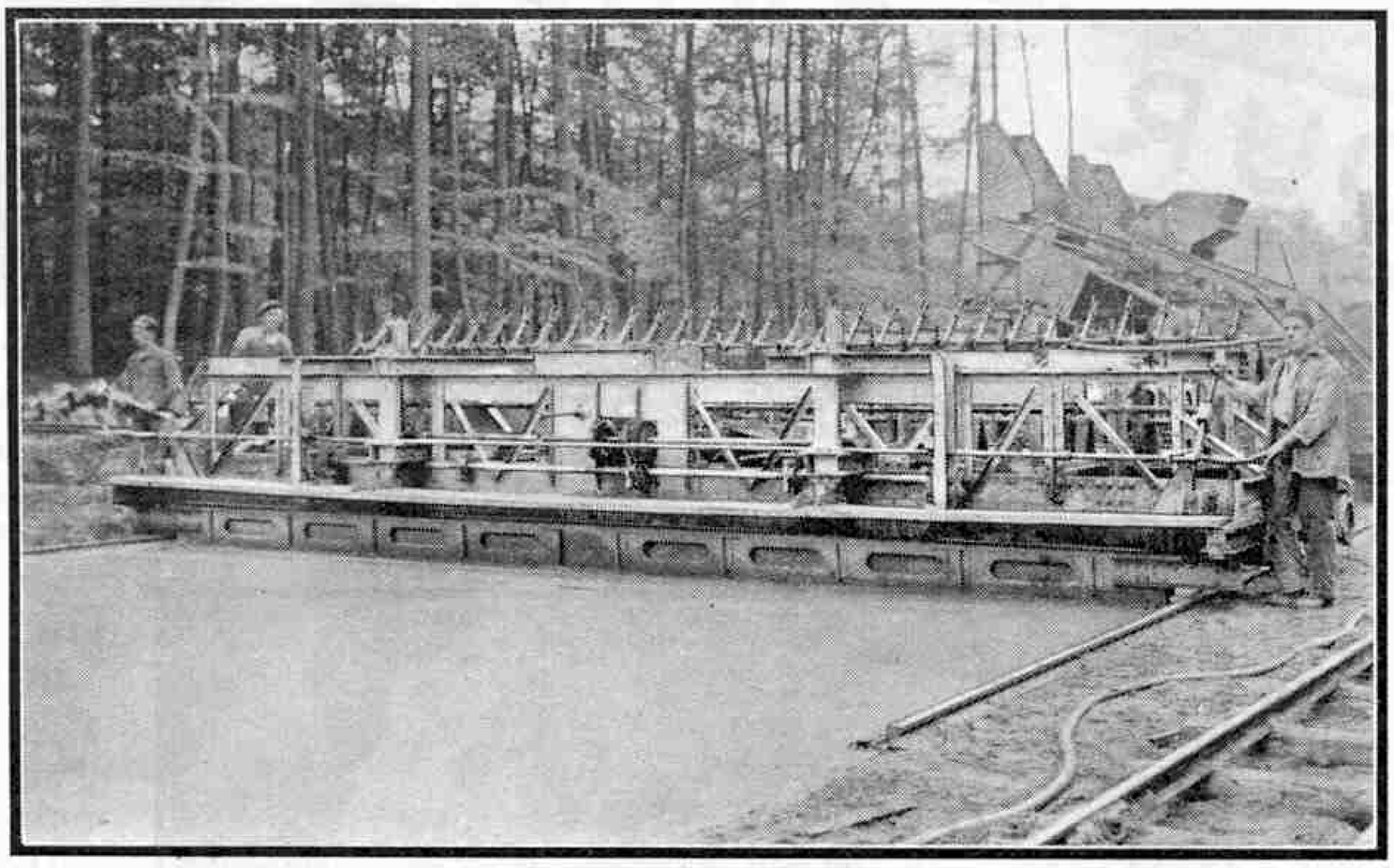
The machine is illustrated in the photographs reproduced with this article. It resembles a gantry crane that stretches from one side of the road to the other and travels along on wheels running on rails at the sides. It is driven by an internal combustion engine and its position can be regulated with the utmost accuracy. Concrete is fed into it continuously, and this is tamped and pounded into shape as the machine moves relentlessly forward, the prepared road foundation ahead of it, and behind it a smooth surfaced road that will be ready for traffic when the material has set. The machine was used in building the Avus motor track in Berlin, on which racing cars have been driven at speeds of 180 m.p.h. or more, and is finding employment in finishing the roads making up the great network of motor highways now under construction in Germany.

Tamping the concrete or other material as it is laid is the work of a battery of drop hammers beating vertically on its surface, or of a tamping beam. The hammers vary in weight according to the size of the machine and the purpose to which it is to be put. In one type, designed for making concrete roads of every thickness, they weigh from 120 lb. to 132 lb. In this case the hammers are 4 in. long and 10 in. wide. They fall through a distance that can be varied from $5\frac{1}{2}$ in. to 7 in. and make 70 strokes a minute.

Tamping beams are made of wood, and in some cases have steel or brass hoops screwed on them. Their effect can be increased by adding ballast plates to increase their weight. In certain machines they make as many as 330 strokes a minute, but in others this is reduced to 150 or even as low as 60 strokes per minute, the usual range of fall being 2 in. to $2\frac{3}{4}$ in. Whether drop hammers or tamping beams are used, the concrete is kneaded into the firmest

possible mass, and voids in the aggregate are eliminated as far as possible.

As the concrete is poured out on to the road foundation it is spread about and given a preliminary shaping by a levelling beam in front of the tamping mechanism. This beam has an oscillating or to and fro movement across the road. Its stroke is about 4 in. and it makes about 220 movements a minute, pushing any excess of concrete in front of the machine as it beats the material to the desired level. A second levelling beam behind the tamper moves vertically, delivering about 600 blows a minute on the surface and making this more even than is possible by any other means.



The concrete road making machine at work. This view shows the back of the machine, with the rear levelling beam that gives the surface of the road its final shape. Beyond it are the concrete distributors.

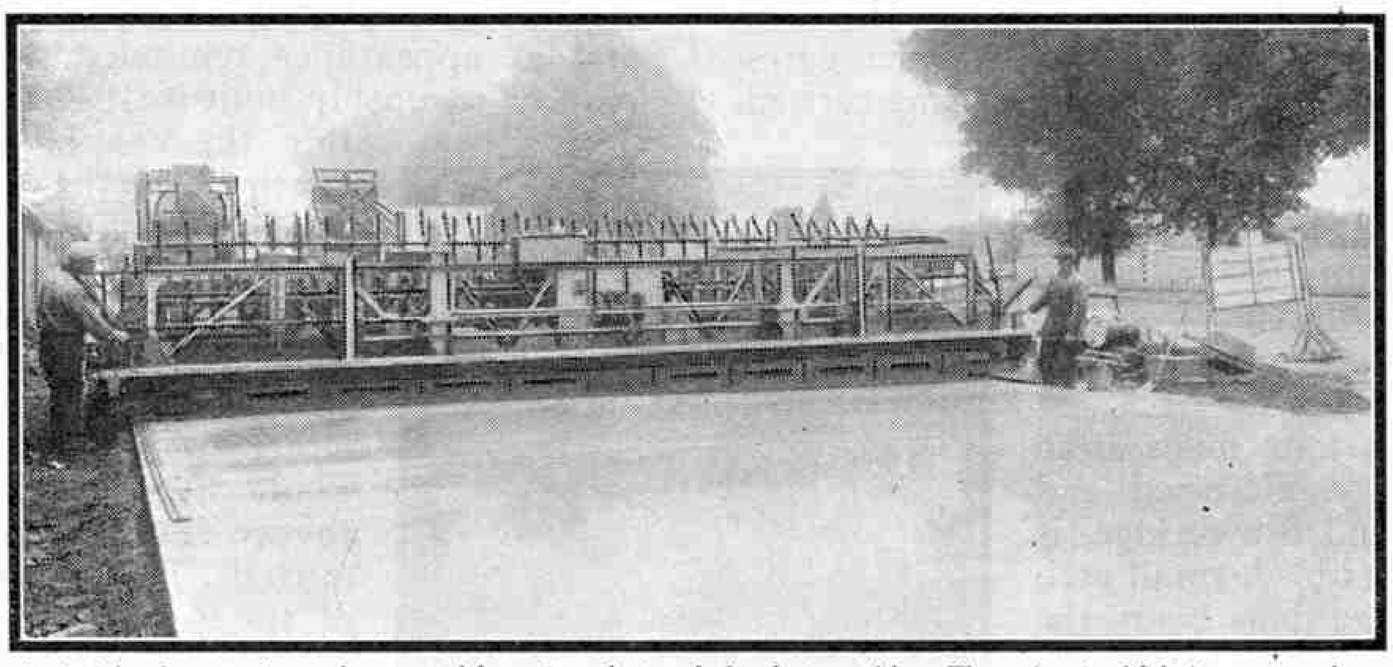
The machine is so arranged that it can conveniently be operated from each side. It incorporates mechanism for driving it along the road in the direction in which it is desired to work. The speed of road making of course is governed by that at which concrete is fed into the machine, and with sufficient supplies of this material, a speed of about 6 ft. per minute is reached by the machine for making concrete roads of every thickness, to which reference already has been made. Other machines have different speeds. One concrete finisher for narrow roads suitable for cycling paths has a forward speed of 7 ft. 5 in. per min. and a backward run of 18 ft. 6½ in. per min., and has only one levelling beam.

All the four wheels on which a machine runs are directly driven in order to prevent vibration and twisting of the frame. Comparatively low power is required, and a 4 h.p. benzol motor is incorporated in the concrete finisher for narrow roads, while machines designed for heavier duties are fitted with benzol or crude oil engines of up to 15-16 h.p., according to their size and the speed at which they are required to work.

The machine can readily be built up or reduced in size to enable roads of various widths to be constructed, and the surfaces of highways of very great width, the whole of which cannot be covered by the machine in use, can be laid down in two or more strips. Rigid kerbs, tramway lines, steel joists or other temporary supports can be used to support the machine, and if a road requires banking at curves a device to enable the change of direction to be made can be fitted. Any camber or shape of road surface can be constructed by using levelling devices of suitable form, and the machine actually has been used to form the lining of the trough of a canal.

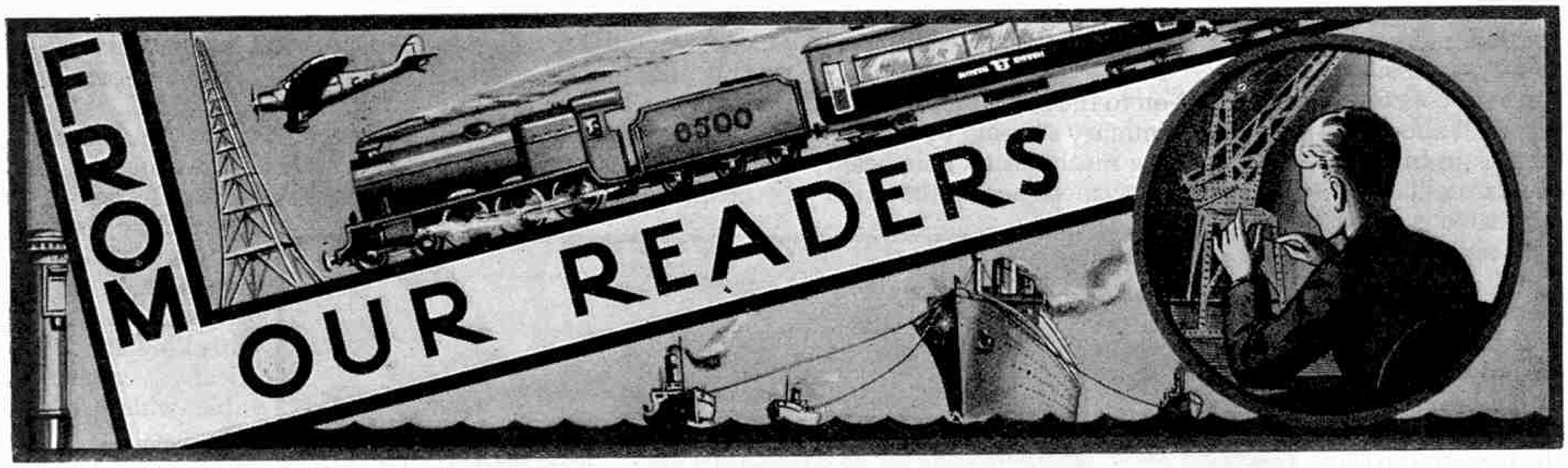
One great advantage of the machine is that the tamping and shaping forces are applied exactly at right angles to the unstable concrete. The result of this vertical compression is seen in the absence of corrugations on roads built by it. Irregularities of this kind are practically unavoidable when rollers are used in road making. Newly-laid surfacing material is plastic and unstable. At certain speeds a roller slides along it, and this, together with the vibration, gives rise to ripples or waves in the road. No such effects can occur with the new road making machine, but in order to ensure against them, and also to avoid joints that run straight across the road, and would affect the wheels at both ends of the axle of a fast running motor vehicle, the machine can be assembled along a line inclined at an angle of 25 deg. to the axis of the road. Actually a road built by the machine has few joints in its surface, for the work of laying down the material used is carried on continuously and without interruption.

Slight modifications are necessary when the machine is applied to the building of roads with bituminous surfaces, such as those of asphalt, tar or tarmac. The tamping and levelling beams are then moistened by sprays of water driven on to them by means of compressed air. The nozzles of the spraying device work under a pressure of 45 lb. per sq. in., and the water is broken up into minute droplets that thoroughly damp the necessary surfaces without using an excess of water. A special heating device is necessary in the case of asphalt, and acetylene burners in the tamping unit raise the temperature of the surfaces to from 150 deg. C. to 200 deg. C. in order to prevent the sticky mass from adhering to them.



A stretch of concrete road prepared by a tamping and shaping machine. The rate at which these machines work is about 6 ft. per minute when ample supplies of road making material are available.

An adequate supply of material must be provided for the road tamping and finishing machine, for it can only be used economically in large scale work in which there is no interruption to its steady progress along the line of a road. This has led to the introduction into service of a new concrete distributing car, the hopper of which swings out over the road bed and spreads the concrete over it.



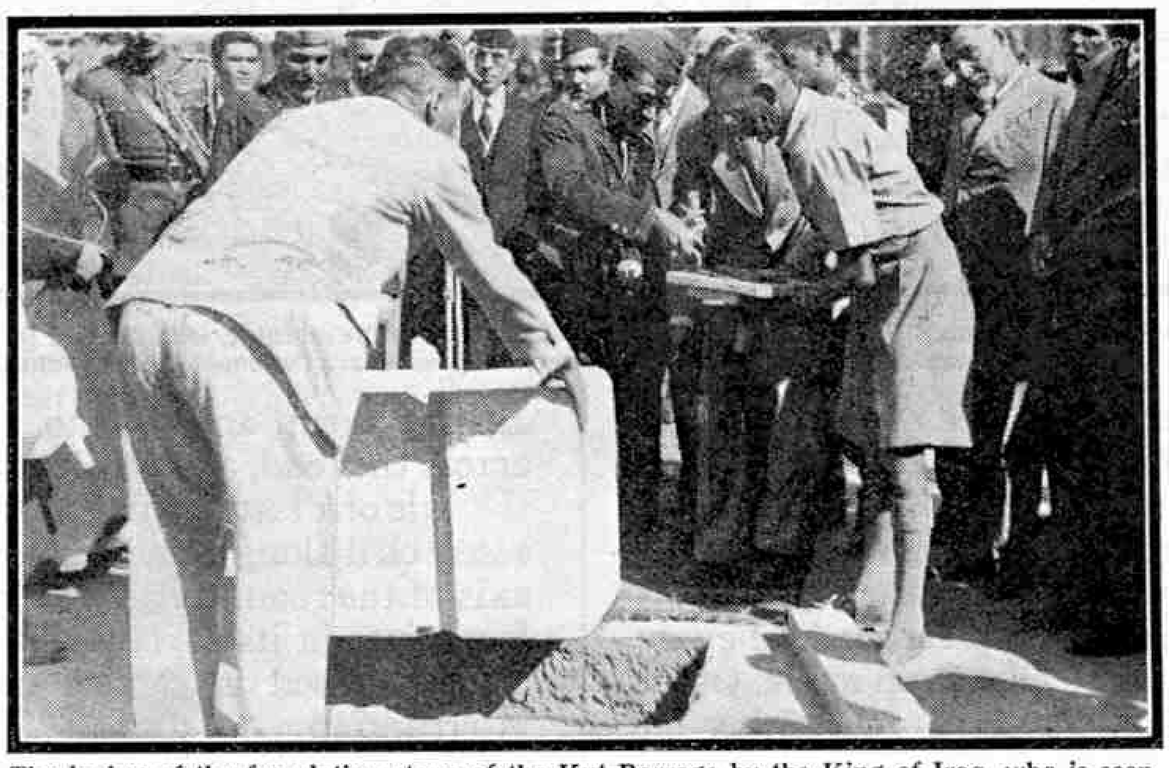
These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

Iraq's Greatest Barrage

A great barrage is now being constructed in Iraq at Kut, the scene of the famous siege during the Great War. It is being built across the Gharraf River, which flows into the Tigris, and I had the good fortune to be present at the laying of the foundation stone of the structure by the King of Iraq, when I obtained the accompanying photograph of the ceremony.

The barrage has been built to supply water for irrigation purposes to great areas of land that have lain waste for many centuries, and also to minimise the danger of inundation when the Tigris is in flood. It will be nearly 2,000 ft. in length and 50 ft. in height, and 56 openings in it, each about 20 ft. in width, will be provided with sluice gates for regulating the flow of water. The work is being carried out by Iraqis working under the direction of British engineers, and is expected to be completed in 1938.

J. G. ABBOOD (Baghdad).



The laying of the foundation stone of the Kut Barrage by the King of Iraq, who is seen lifting mortar with a trowel. Photograph by J. G. Abbood, Baghdad.

Ince Castle and its Cork Tree

Ince Castle is about four miles from Saltash, and although modernised and without its old moat and drawbridge, is still recognisable as a castle. A small arch at the entrance to its gardens bears the date 1657.

An outstanding feature of this interesting old castle is a cork tree in its gardens that is between 150 and 180 years old. There are very few cork trees in this country, and the climate of course does not permit the bark of the tree to be shaved off periodically, as is done with cork trees in Mediterranean countries.

Ince Castle was one of the last strongholds to surrender in the Civil Wars, when it was captured by a ruse. Ships approached it on the river that flows past it, and the soldiers defending it, fearing a bombardment, withdrew to where is now the castle lawn. A concealed land force then suddenly attacked the unguarded defences and forced an entrance.

J. DARTON (Plymouth).

The Smallest House in Great Britain

There are many features of interest in the little old-world town of Conway, in North Wales, and probably the most curious is the tiny dwelling standing on the quay-side of the river. This is claimed to be the smallest house in Great Britain. It is only 5 ft. wide, and although its rooms are very small, they are furnished in the usual way. The door is of normal size.

On the opposite side of the river is a wooden landing stage, to which the river steamers are moored. These are driven by paddle wheels and in appearance reminded me of the "*Comet*," the pioneer steamship built in 1812 by Henry Bell. At high tide the vessels are left high and dry at their berths.

This house at Conway is claimed to be the smallest in Great Britain. Photograph by J. Thomas, Glasgow.

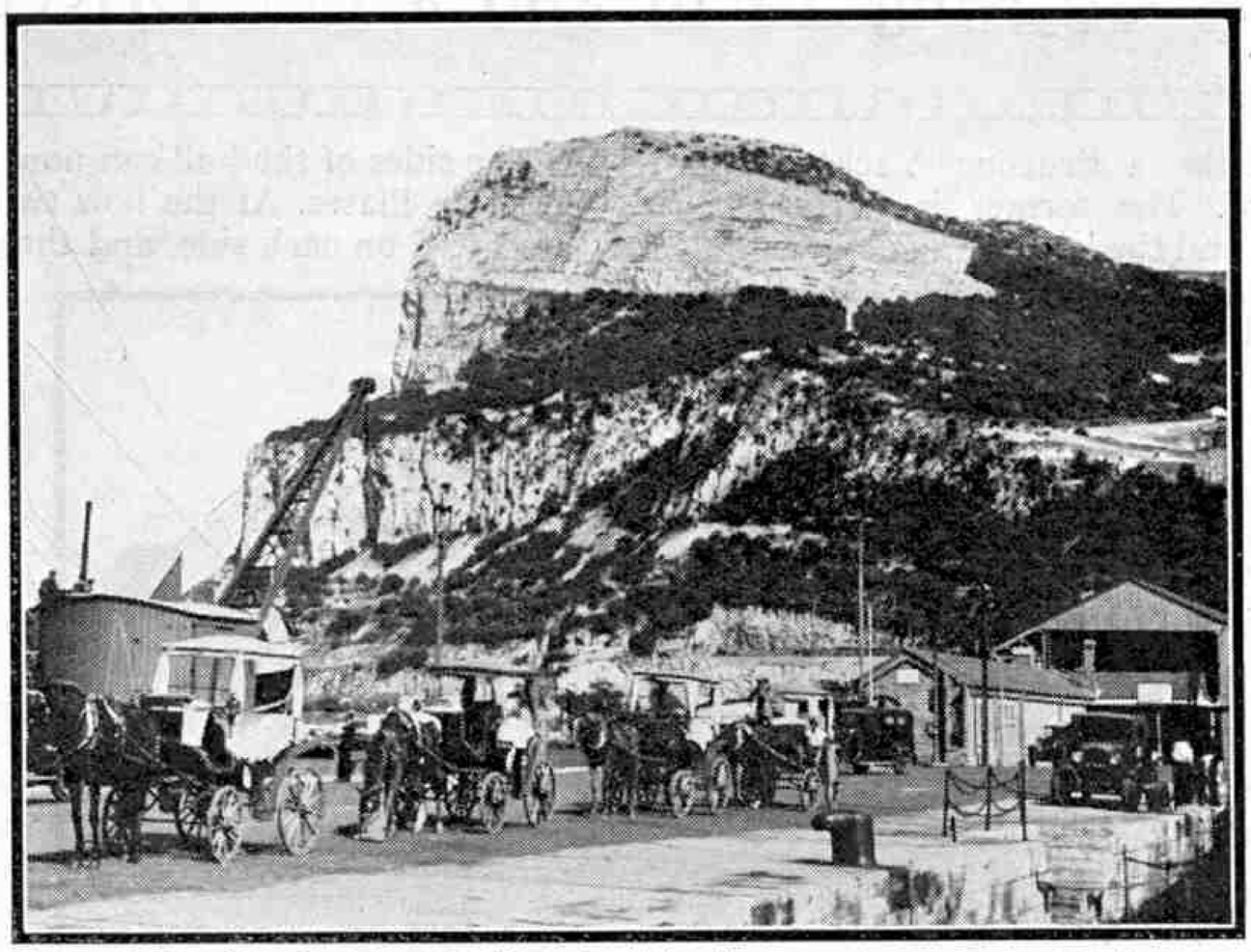
The bridges across the River Conway are of special interest. The road is carried over the river by a suspension bridge built by Telford during the years 1822-1826. Before its erection travellers had either to be piloted across the shifting sands at low tide, or ferried across the swirling waters when the tide permitted. The up and down main lines of the L.M.S.R. span the river on two tubular bridges that resemble the Britannia Tubular Bridge in design, and another suspension bridge leads the town's water supply across the river. The 13th century castle, the town walls, and several fine old buildings of the Tudor period add to the attractions of this quaint Welsh town. The presence of Conway Castle at one end of Telford's bridge influenced its design to a certain extent. An effort was made to reproduce the mediæval appearance and character of the Castle, but this was not very successful.

J. THOMAS (Glasgow).

A Visit to Gibraltar

Gibraltar has been famous as a fortress for centuries and now is equally well known as a port of call for cruising liners. The great rock rises 1,400 ft. above sea level and is visible for many miles. Half a day usually is allowed for its inspection in the popular cruising itineraries, and although the time is short, the rock provides one of the finest shore excursions imaginable.

When a vessel arrives off Gibraltar, the passengers are taken ashore in steam launches, and a tour of the town can be made in a gharry, or horse cab. Several of these vehicles can be seen in the accompanying illustration. The drive to Europa Point, about three miles from the quay, is full of interest. This Point is the southern tip of the rock and from it one looks out southward across the straits to the African coast. Another interesting excursion, involving a walk of 1½ miles, takes the visitor past the Racecourse, and over the neutral ground connecting Gibraltar with the Spanish mainland, to the Andalusian town of La Linea, which is entered through the Spanish customs station.



A scene in Gibraltar, showing part of the rock and the gharries, or horse cabs, in which tours are made by visitors. Photograph by T. Brooks, Halifax.

Among the greatest attractions in Gibraltar are the galleries excavated within the rock on the west and north sides. These are hewn out of the rock itself and have a total length of more than two miles and are wide enough to allow the passage of a carriage. They formed part of the fortifications designed by military engineers during the 18th century, and the portholes, cut at intervals of 12 yds., were so constructed that men serving the guns in the galleries were safe from the shot of the enemy. The galleries are accessible only to British subjects, who must be provided with a permit before they are admitted. The tour of inspection is made in one direction only and no photographs can be taken on the way. Cameras must be handed in at the entrance, and a messenger takes them down to the exit to await the arrival there of the owners.

Gibraltar has often been attacked. The most memorable siege was that sustained for four years from 1779 to 1783, when the British garrison repelled the efforts by land and sea of combined French and Spanish forces.

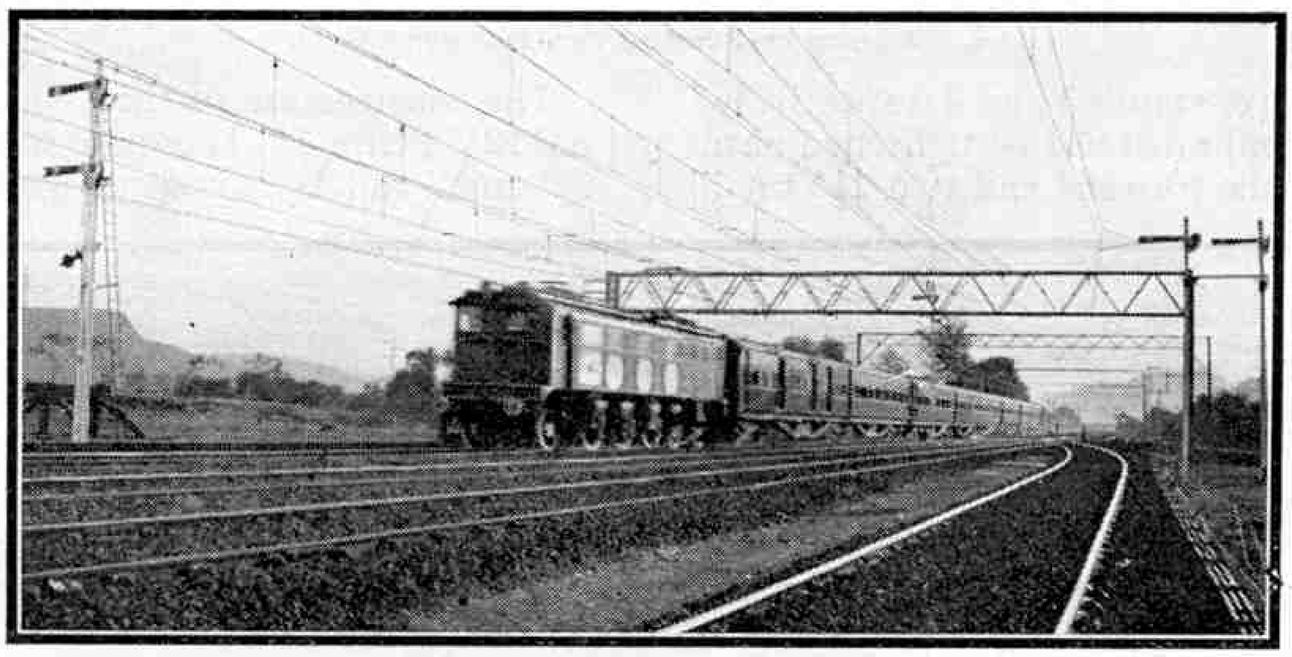
T. Brooks (Halifax).

The Run of the "*Deccan Queen*"

I obtained the accompanying photograph of the "*Deccan Queen*," one of India's fastest and most luxurious expresses, as it was approaching Lonavla station, on the Bhore Ghat. This train runs daily between Bombay and Poona, covering the distance of 119¼ miles in 2 hrs. 45 mins. The down train leaves Bombay at 5.15 p.m., and the up train leaves Poona at 7.40 a.m., both taking the same time to complete the run.

Two special rakes, or set trains, are utilised on this service, one of them being equipped with roller bearings and both being fitted with self-adjusting brakes. Each has a total tare weight of 278 tons and comprises eight coaches, including a restaurant car, made up in three articulated units of three, three and two coaches respectively. Both rakes are finished in royal blue, with gold lining and lettering, and the Great Indian Peninsula Railway coat of arms is carried on each coach.

The electric passenger locomotive shown at the head of the train in the photograph is one of 22 similar units supplied by Metropolitan Vickers Ltd. It has six motors, with a total output of 2,160 h.p., and is capable of a maximum speed of 85 m.p.h., but the greatest allowed is 65 m.p.h. In working order its weight is 102.45 tons, and its length is 53 ft. 6 in.



The "Deccan Queen" approaching Lonavla. This electrically hauled train of the Great Indian Peninsula Railway is one of the fastest expresses in India. Photograph by W. S. Eagle, Bombay.

The down "*Deccan Queen*" has a difficult task when it reaches the hills. Its first stop is made at Karjat, 62 miles from Poona, after a run of 70 mins., and there a halt of 4 mins. is made so that a banking engine may be attached. Gradients of between 1 in 50 and 1 in 37 are then encountered in the Bhore Ghat section, in which the train passes through 26 tunnels and climbs about 1,800 ft. to Lonavla, 236 ft. above sea level. This section is 17¼ miles in length and is traversed in 35 mins., the average speed being 30 m.p.h., but the next 36 miles are covered in 41 mins. without the aid of a banking engine. The up "*Deccan Queen*" of course requires no assistance between Lonavla and Karjat, for it descends the steep slopes of the Bhore Ghat. The service provided by these two fine trains is very popular with Bombay business men, especially at week-ends.

W. S. Eagle (Bombay).

Two New Meccano E Outfit Models

A Cruising Yacht and a Pile Driver

THIS month we describe a Cruising Yacht and a Universal Pile Driver. The former is particularly handsome in appearance, and the latter is a good example of a realistic working model. Each can be built entirely from the parts included in E Outfit.

The first of the two models represents a popular form of yacht that really is a converted ship's boat. Many vessels of this kind can be seen at various places on our coasts during the summer. The changes necessary for the conversion usually are carried out by amateurs, and the vessels thus produced show wide variations. No standard prototype therefore is available for the model-builder, who is given considerable scope for the expression of his ideas of form and rig.

The model is Bermuda-rigged on each mast and has a small cockpit or well. Its construction is commenced by building up the keel from two $12\frac{1}{2}''$ Strips. These are held together by three bolts, two of which also hold together the parts of stands 1 and 2 respectively. These bolts are left slack and must not be tightened until the hull is completed. At the forward end two $2\frac{1}{2}''$ small radius Curved Strips are fitted, to the upper ends of which is secured a $2\frac{1}{2}''$ Strip 3. Two $2\frac{1}{2}''$ large radius Curved Strips are fitted at the after end, and these carry two $1\frac{1}{2}''$ Strips 4. Between the Strips 3 and 4 are fitted two curved side members, each of which consists of a $12\frac{1}{2}''$ and $5\frac{1}{2}''$ Strip over-lapping each other by two holes. These side members are curved so that the widest portion of the hull is at a point 5" from the stern. A $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket 5 preserves the shape at the stern.

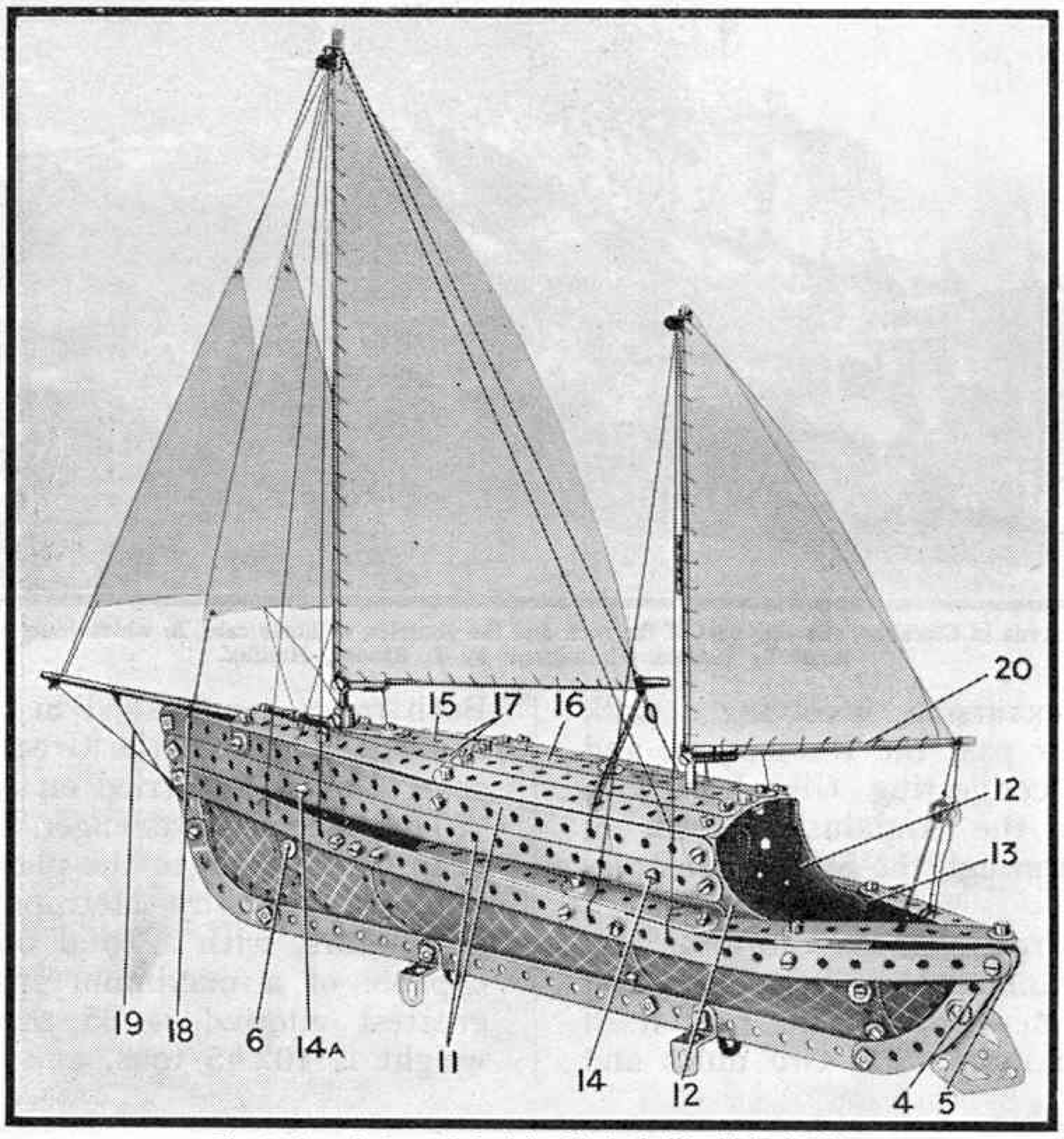


Fig. 1. A typical small Cruising Yacht built with E Outfit.

The sides of the hull can now be filled in with Strip and Flexible Plates. At the bow two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plates are fitted on each side, and their lower edges are clamped between the Strips forming the keel and bow. The edges of the two Plates are clamped together by means of a nut and bolt and two washers 6. A $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Strip Plate is curved to the shape of the next section, shown in Fig. 2, and is secured in place at its lower edge by means of an Obtuse Angle Bracket. The bolts holding this Bracket are shown at 7. A $4\frac{1}{2}'' \times 2\frac{1}{2}''$ Flexible Plate 8 is next clamped at one end by the bolt 9 to the Strip Plate mentioned earlier. At its other end this Plate is secured to a $2\frac{1}{2}'' \times 1\frac{1}{2}''$ Flexible Plate 10, the corner and lower edge of which are clamped between the Curved Strips forming the stern. The construction is repeated on the port side of the model. The ends of the two bolts holding the $1\frac{1}{2}''$ Strips 4 together press against each other and the bridge so formed carries the rudder, a Flat Trunnion.

The construction of the cabin is commenced by fitting the $12\frac{1}{2}''$ Strips 11. These are secured at their after ends to $2\frac{1}{2}''$ small radius Curved Strips 12 that are bolted to the $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets 13. Two compound strips are built up, each of two $5\frac{1}{2}''$ Strips over-lapping one hole, and on each side one of these is secured at one end to the Angle Bracket 13 and placed under Strips 11. In this position it is held by means of two Flat Brackets, and the holding bolts for these are indicated at 14 and 14a.

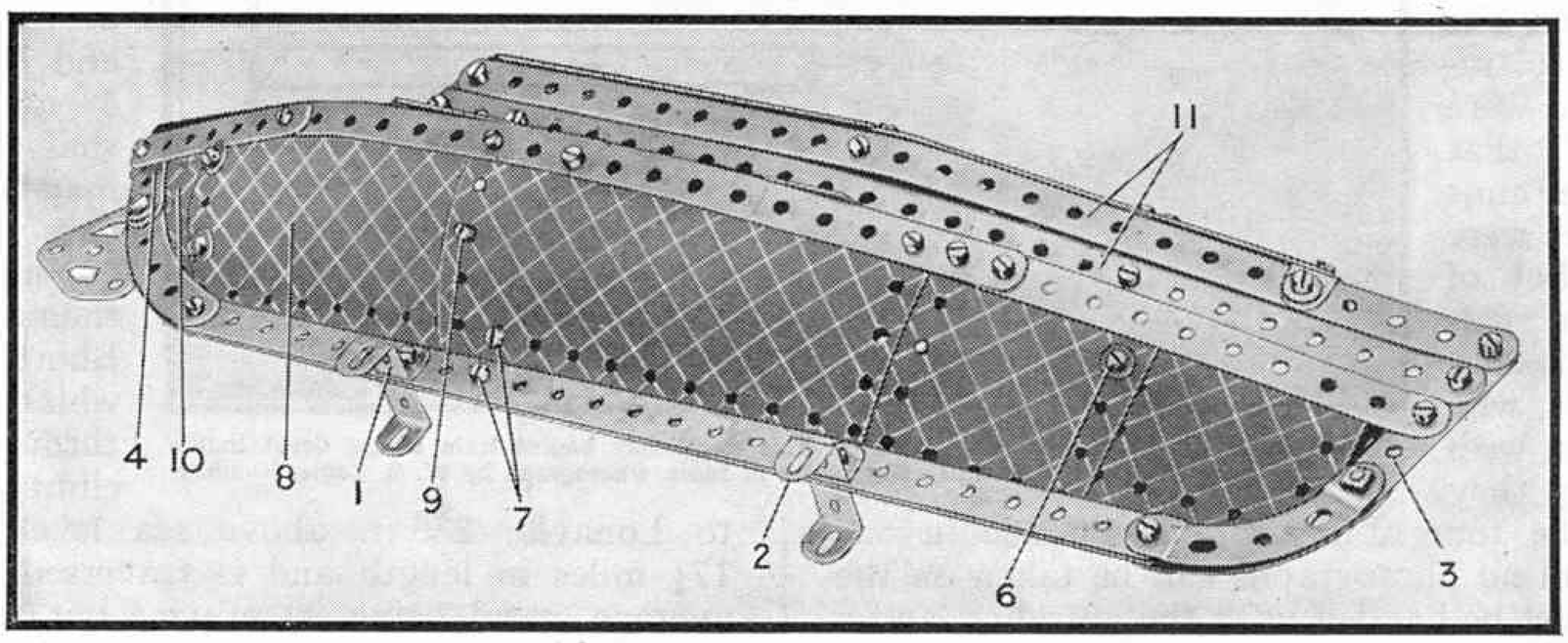


Fig. 2. The hull of the Cruising Yacht, showing how it is built up and its sides are filled in.

Two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips are next curved slightly to the shape of the top of the cabin, as shown in Fig. 1, and bolted between its two sides. Across these are fitted

five $5\frac{1}{2}$″ Strips. Three similar Strips are secured to the front Double Angle Strip and the middle one of these 15 overlaps the Strip 16 two holes. Two $3\frac{1}{2}$″ Strips 17 are also fitted at this point. Each of the side decks consists of one 2″, one 3″ and two $3\frac{1}{2}$″ Strips, all bolted to $\frac{1}{2}$″ × $\frac{1}{2}$″ Angle Brackets on the hull.

The mizzen mast consists of two 4″ Rods joined by a Coupling, and the boom 20 is secured to it by a Swivel Bearing. The main boom is held in place in the same manner. One of these Swivel Bearings is built up from a Small Fork Piece and Collar. The arrangement of the shrouds and halyards is shown in Fig. 1. The sails are cut from stiff white paper, the main and mizzen sails being laced to the masts and booms by continuous lengths of cord.

The parts required to build the model Yacht are: 8 of No. 1; 14 of No. 2; 6 of No. 3; 2 of No. 4; 4 of No. 5; 2 of No. 6a; 6 of No. 10; 2 of No. 11; 3 of No. 12; 4 of No. 12c; 1 of No. 13; 2 of No. 15; 3 of No. 15a; 2 of No. 35; 77 of No. 37; 1 of No. 37a; 17 of No. 38; 2 of No. 48a; 1 of No. 59; 2 of No. 62; 1 of No. 63; 2 of No. 90; 4 of No. 90a; 4 of No. 111c; 1 of No. 116a; 4 of No. 125; 1 of No. 126a; 1 of No. 165; 1 of No. 176; 2 of No. 188; 4 of No. 190; 2 of No. 191; 2 of No. 195.

In constructing the second model, a Universal Pile Driver, the travelling base is first built. This consists of a $5\frac{1}{2}$″ × $2\frac{1}{2}$″ Flanged Plate, to each end of which is bolted a $3\frac{1}{2}$″ × $2\frac{1}{2}$″ Flanged Plate. The two latter Plates are connected by means of two $5\frac{1}{2}$″ Strips, one of which is shown at 1, Fig. 3. Two Flat Trunnions 2 are fitted to one end of the large Flanged Plate, at the other end of which two Trunnions are held in place by Flat Brackets. These Trunnions and Flat Trunnions are joined together by $5\frac{1}{2}$″ Strips and carry $3\frac{1}{2}$″ Rods on which the travelling wheels are gripped. Outriggers to prevent the machine from over-turning are fitted to the travelling base as shown.

The base of the superstructure is built up from two $12\frac{1}{2}$″ Angle Girders, each of which is extended by two $5\frac{1}{2}$″ Strips 3, overlapping one hole. Each pair of $5\frac{1}{2}$″ Strips is fitted with an Angle Bracket at its outer end and the two built up angle girders are connected by a $2\frac{1}{2}$″ Strip, fitted with a Double Bracket 4. This Double Bracket carries a Threaded Pin, arranged horizontally.

The revolving superstructure turns about a 3″ Pulley that is secured to the $12\frac{1}{2}$″ Angle Girders by means of two $\frac{3}{8}$″ Bolts, each of which carries three Washers for spacing purposes. A 2″ Rod, gripped in the boss of this Pulley, passes through the centre hole of the $5\frac{1}{2}$″ × $2\frac{1}{2}$″ Flanged Plate of the travelling base, and is held in place by means of a Bush Wheel.

The slides for guiding the pile driving weight consists of four $12\frac{1}{2}$″ Strips, joined together in pairs by $2\frac{1}{2}$″ Strips. These compound strips are secured to the Double Angle Strips 11 and 12 at their upper and lower ends, and in the centre they are coupled to the frame by means of $\frac{1}{2}$″ Reversed Angle Brackets. Near the top a Reversed Angle Bracket 14 is bolted in place, and this forms a support for a Double Bracket 15.

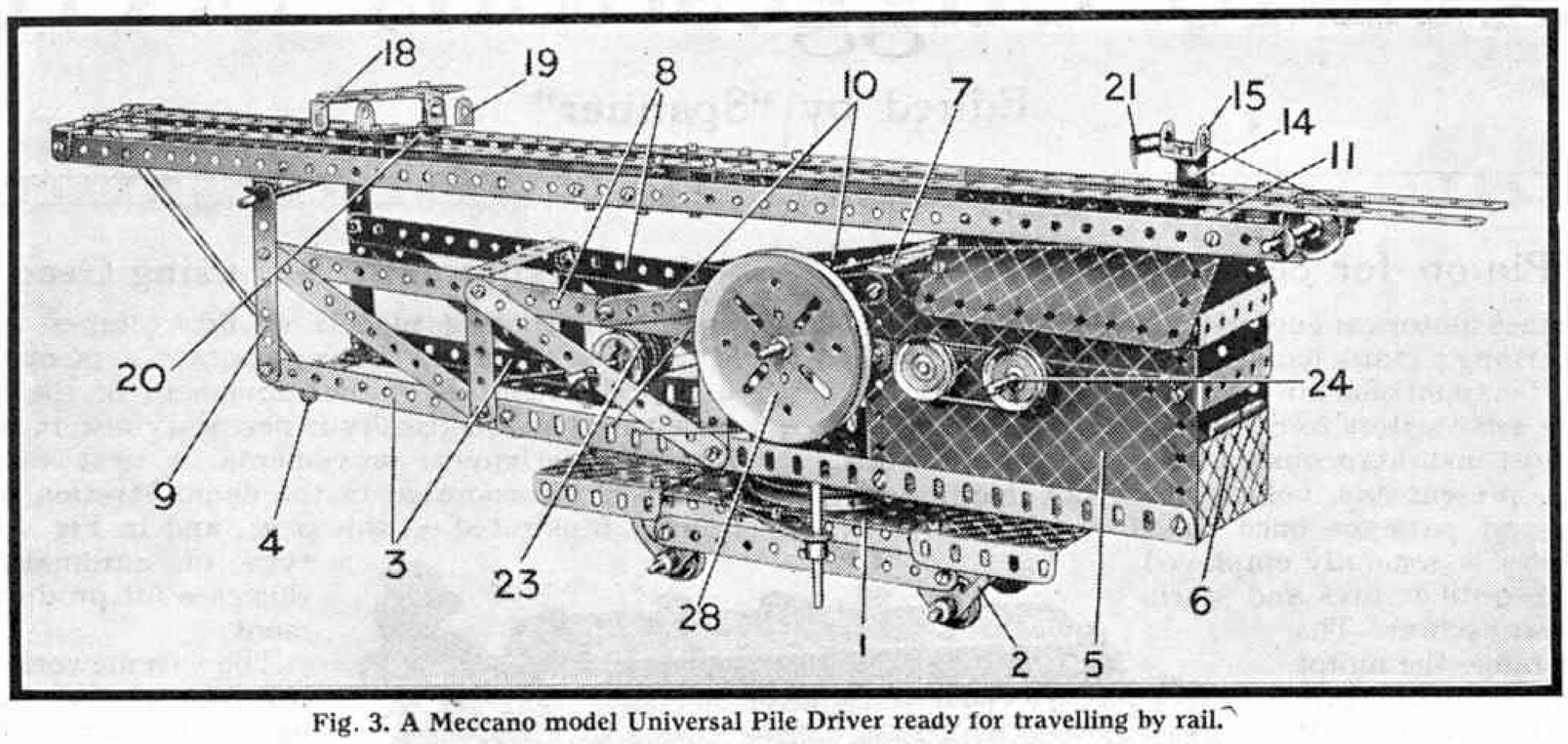


Fig. 3. A Meccano model Universal Pile Driver ready for travelling by rail.

The weight is built up from a $1\frac{1}{2}$″ × $\frac{1}{2}$″ Double Angle Strip, at the bottom of which are bolted a Flat Bracket 16 and two $\frac{1}{2}$″ × $\frac{1}{2}$″ Angle Brackets 17. The opposite end of the Double Angle Strip carries a $2\frac{1}{2}$″ × $\frac{1}{2}$″ Double Angle Strip 18 and Double Bracket 19. A $\frac{1}{2}$″ loose Pulley 20 forms the guide and slides between the double compound strips already described. The Angle Bracket 21 engages with the Double Bracket 19 when the weight is being hoisted. When the weight is near the top, the bracket 15 causes these Brackets to slide apart, thus bringing about its release.

The Angle Bracket 21 is tied to a cord 22 that passes under one of the Pulleys 23, and is secured on the Crank Handle 24. The cord 25 for lowering the hammer frame also passes round one of the Pulleys 23, and is secured to a Crank Handle on which the 1″ Pulley 26 is mounted. When lowering, the Driving Band 27 is used to connect the Pulley 26 and the Pulley on the Crank Handle 24, Fig. 3.

The duplicated cords for lifting the frame pass first round a Threaded Pin in the Double Bracket 4, and then round one of the Pulleys 23 before being secured to an Anchoring Spring on the Rod carrying the Pulley 28. The opposite end of the Rod carries a Coupling fitted with a $\frac{3}{4}$″ Bolt for a handle, the Coupling being spaced away from the superstructure by a Double Bracket. Counter balance weights must be fitted inside the cab.

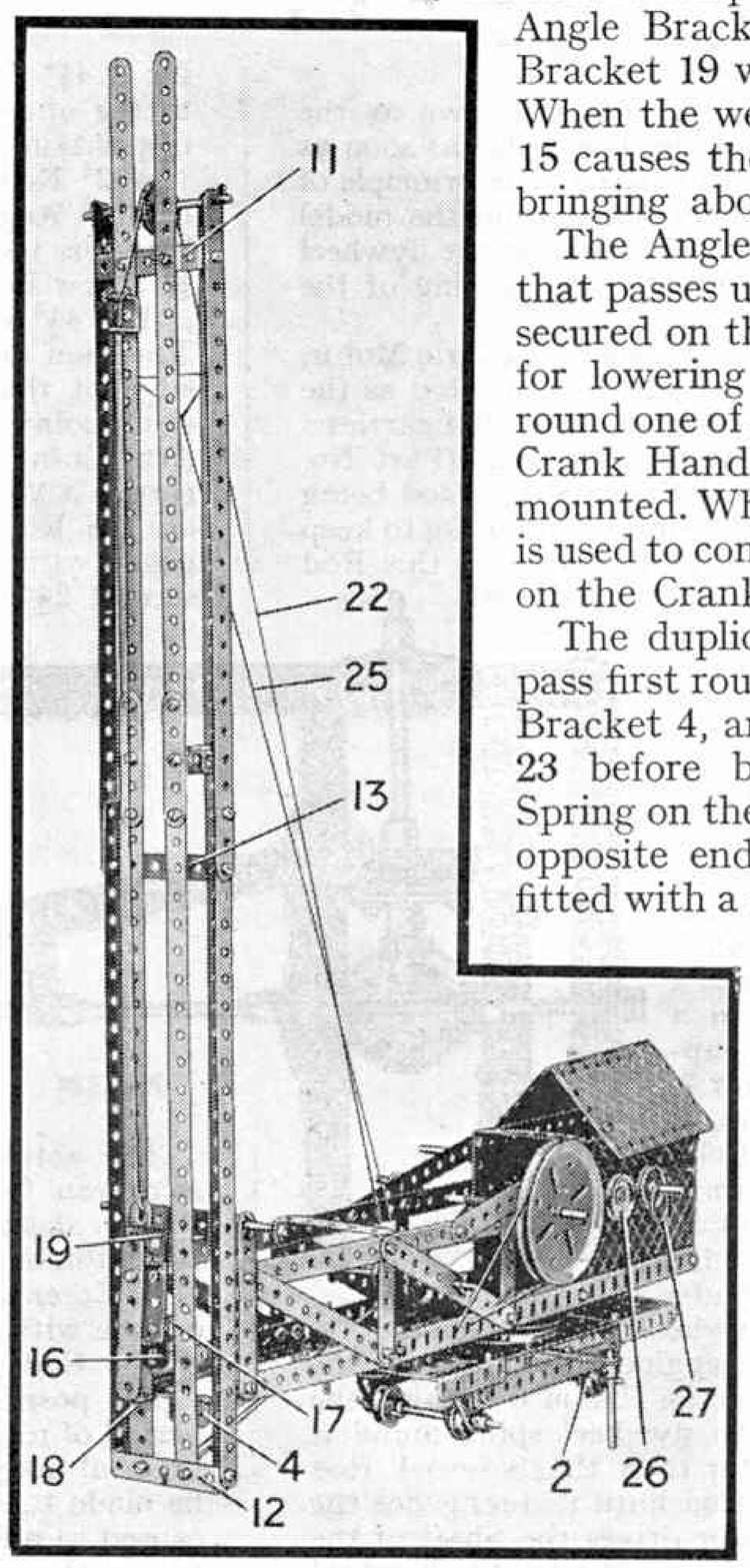


Fig. 4. The Universal Pile Driver prepared for use.

The parts required to build the Pile Driver are: 10 of No. 1; 14 of No. 2; 4 of No. 3; 2 of No. 4; 12 of No. 5; 4 of No. 8; 4 of No. 10; 4 of No. 11; 6 of No. 12; 4 of No. 12c; 1 of No. 15a; 2 of No. 15b; 3 of No. 16; 2 of No. 17; 1 of No. 18a; 1 of No. 19; 1 of No. 19s; 2 of No. 19b; 4 of No. 20b; 4 of No. 22; 2 of No. 22a; 1 of No. 23; 1 of No. 24; 14 of No. 35; 90 of No. 37; 7 of No. 37a; 12 of No. 38; 1 of No. 48; 8 of No. 48a; 1 of No. 51; 1 of No. 52; 2 of No. 53; 4 of No. 59; 2 of No. 62; 1 of No. 63; 1 of No. 111; 5 of No. 111c; 1 of No. 115; 3 of No. 125; 2 of No. 126; 2 of No. 126a; 1 of No. 176; 1 of No. 186; 2 of No. 189; 2 of No. 195; 1 of No. 198.

Meccano Suggestions Section

Edited by "Spanner"

(347)—Bendix Pinion for Self-Starter (E. Jones, Cardiff)

It is not very long since motor car engines had to be started by the laborious process of turning a crank handle, and some of the old cars required a great deal of manual effort in order to set the engine going. The practice of fitting self-starters to cars is now almost universal. The engine starts almost instantaneously at the touch of a button, and the driver of a present-day vehicle does not require the reserves of strength and patience once called for!

A small electric motor is generally employed for driving the engine until it fires and starts running under its own power. The usual practice is to arrange the motor so that a small pinion on the armature shaft can be brought into engagement with teeth cut in the flywheel of the engine. Reduction gear provides a powerful drive for turning the engine crankshaft, which is rotated at a comparatively slow speed. The starter motor therefore would be driven at very high speed when the engine comes to life, and would soon be ruined, if some automatic device were not fitted to disengage the driving pinion.

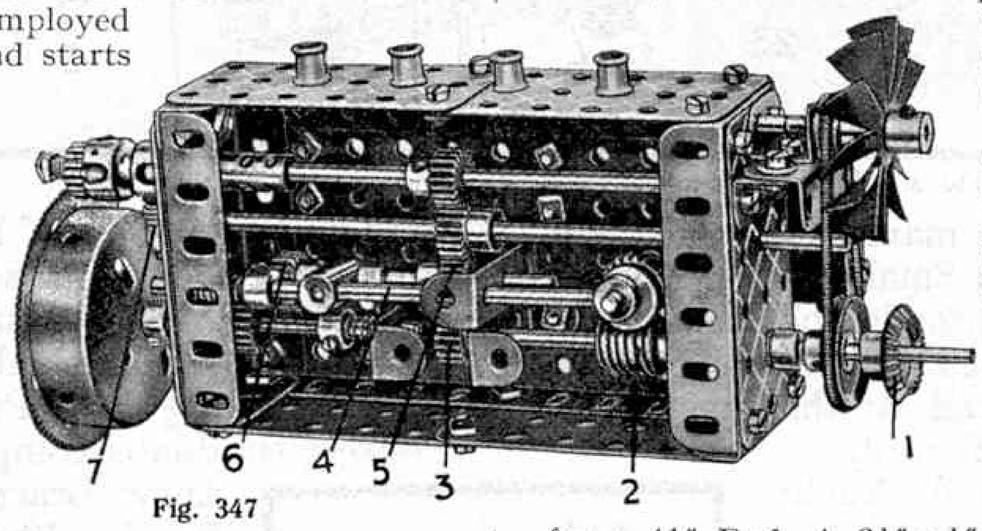


Fig. 347

The mechanism that is used for this purpose is known as the Bendix Pinion, and automatically uncouples the motor as soon as the Pinion is driven faster than the armature shaft. The principle of operation of the Bendix drive will be understood from the model illustrated in Fig. 347, in which the Bendix Pinion and the flywheel are driven alternately to show the automatic disengaging of the Pinion.

The Bevel Gear 1 is driven from a Clockwork or Electric Motor, and the Worm 2 and Pinion 3 are carried on the same Rod as the Bevel. The Worm drives a Pinion on a transverse Rod that carries a cam formed from the Kemex Universal Stand Clamp (Part No. K31). The end of the Rod 4 bears against the cam, the Rod being slidable in its bearings and fitted with a Compression Spring to keep it in constant engagement with the cam. A Coupling on this Rod controls the sliding movement of the Rod fitted with Pinions 5 and 6. The Pinion 5 is shown in engagement with another Pinion driving a further similar Pinion on the Rod of the Bendix Pinion. When the cam slides the Rod 4 to the left, the Pinion 5 is disengaged, and Pinion 6 is brought into mesh with a Pinion on the Rod of the flywheel.

A 2″ Screwed Rod carries the Bendix Pinion and is attached to a 5″ Rod by means of a Threaded Coupling. Locknuts are fixed on the end of the Screwed Rod to serve as a stop for the Pinion, which is fitted in a Socket Coupling. The other end of the Coupling carries a Threaded Boss, and a weight 7, consisting of a Collar and four Washers, is fixed to the Socket Coupling by a ½″ Bolt.

This weight prevents the Pinion from rotating on its rod, and it will be clear that as the Screwed Rod is rotated in the Bendix Pinion unit it causes the Pinion to move into engagement with the 2½″ Gear of the flywheel. This drives the flywheel, and in actual practice starts up the engine. The starting of the "engine" is achieved in the model when the Pinion 6 engages the Pinion on the flywheel shaft. When the flywheel spins round it causes the Bendix Pinion to rotate faster than the Screwed Rod carrying it, thus screwing it along the Rod until it disengages the gear. At this stage the Pinion 5 no longer drives the Shaft of the Bendix Pinion, which remains out of engagement until the flywheel stops after the withdrawal of Pinion 6. The drive is then once more transferred to the uppermost Rod.

In the illustration one of the side Plates is removed from the mechanism casing. When the Plate is in position the casing somewhat resembles a motor car engine, and a Fan is fitted and driven by Spring Cord from the driving shaft to improve the effect.

(348)—Automatic Reversing Gear (L. Keith, Edinburgh)

In constructing models of lifts, cranes, cable railways, etc., it is often desirable to incorporate a mechanism that will give a periodic reversal of the movement of the model. A drive that is reversed automatically is necessary also in many models demonstrating mechanical movements. A neat automatic gear change device is incorporated in the demonstration model of the Bendix Pinion, illustrated on this page, and in Fig. 348 is shown another type of automatic gear change, in this case for producing reversing movement.

The framework in this example consists of 7½″ Angle Girders built up in the form of a square, with two additional Angle Girders of similar length inserted between opposite sides. The latter Girders support two 2½″ Angle Girders bolted in the fifth and the eighth holes from the upper ends of the 7½″ Girders. They are bolted beneath the longer Girders and the upper one has a Flat Trunnion bolted to it to serve as a bearing for a 4½″ Rod. A 2½″×½″ Double Angle Strip is placed parallel to the upper 2½″ Angle Girder and directly above it, being fixed in position by a Flat Trunnion at each end.

A 2″ Rod is journalled between the 2½″ Angle Girder and the Double Angle Strip, and carries a ½″ Pinion secured on the Rod between its two bearings. Above the Double Angle Strip is a ¼″ throw Eccentric, the purpose of which will be described later.

The 4½″ Rod already mentioned is carried at one end in a Flat Trunnion and at the other end in a Trunnion bolted to the outer edge of the frame of the mechanism. It should be noted that at all points where a Rod is journalled in a hole, a Crank or Double Arm Crank is fitted to form a reinforced bearing. The 4½″ Rod carries a Worm that is in constant engagement with the ½″ Pinion on the Rod of the Eccentric. A ½″ Pinion on the 4½″ Rod engages with a 1½″ Contrate Wheel on a Rod journalled in the second 2½″ Angle Girder, and driven from the source of power; an Electric Motor or similar unit.

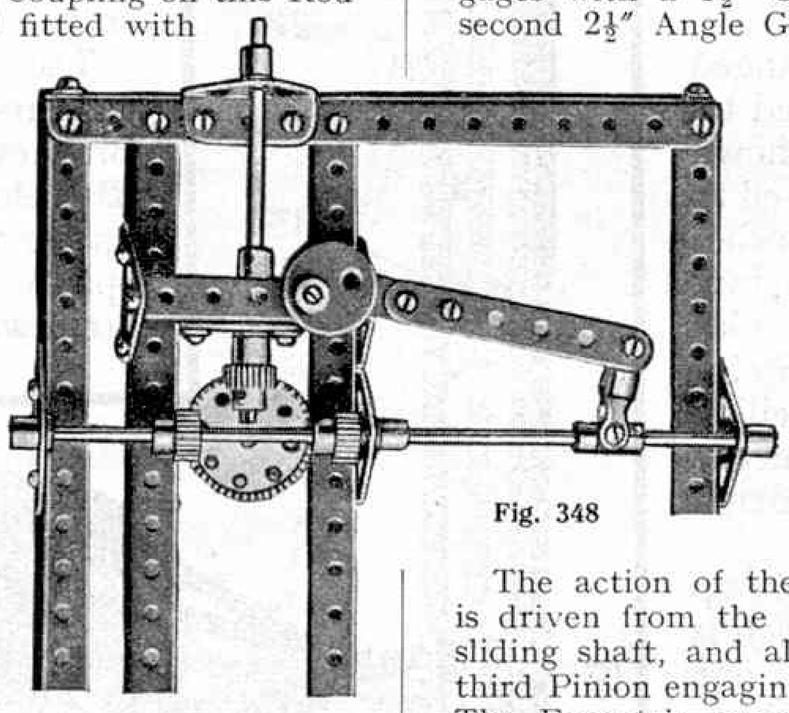


Fig. 348

Across the face of the Contrate Wheel is another Rod so arranged that it is free to slide in bearings built up from Flat Trunnions and Cranks. This Rod is provided with two ½″ Pinions that are brought alternately into engagement with the 1½″ Contrate Wheel by means of the Eccentric, that is coupled to the Rod by a 3″ Strip and Swivel Bearing. The Strip is connected rigidly to the Swivel Bearing by a Pivot Bolt and Collar, the "spider" of the Swivel Bearing being free on the Rod. It is prevented from moving laterally by means of two Collars.

The action of the model will now be seen. As the Contrate is driven from the Motor, it rotates one of the Pinions on the sliding shaft, and also slowly rotates the Eccentric through the third Pinion engaging with it, and through the Worm and Pinion. The Eccentric causes alternate Pinions on the sliding Rod to engage with the Contrate, thus reversing the direction of rotation of the Rod.

The positions of the Pinions on the Sliding Rod determine the period of rotation in each direction and the amount of dwell before reversal takes place. By varying these positions the driven Rod can be made to rotate for equal periods in each direction, or it can be caused to rotate for a very brief period in one direction and then to run in the reverse direction for a comparatively long period. The rotation also can be reversed instantly or after a pause.

It will be clear that if a Pinion of ½″ face is substituted for one of the ¼″ face Pinions the period of rotation for one direction can be considerably increased. With this arrangement the reverse movement would have to be very brief unless a large Eccentric is used to give a longer throw.

(349)—Gearless Reduction Drive (L. C. Pudney, Gloucester)

Friction drives generally create a great deal of interest among Meccano enthusiasts. It is possible to obtain gear ratios that are variable within very fine limits by using friction gearing, and an unusual application of friction drive transmission is shown in Fig. 349. In this case it will be found that adjustments can be made to vary the ratio from about 25 : 1 to 150 : 1, or to even a greater extent.

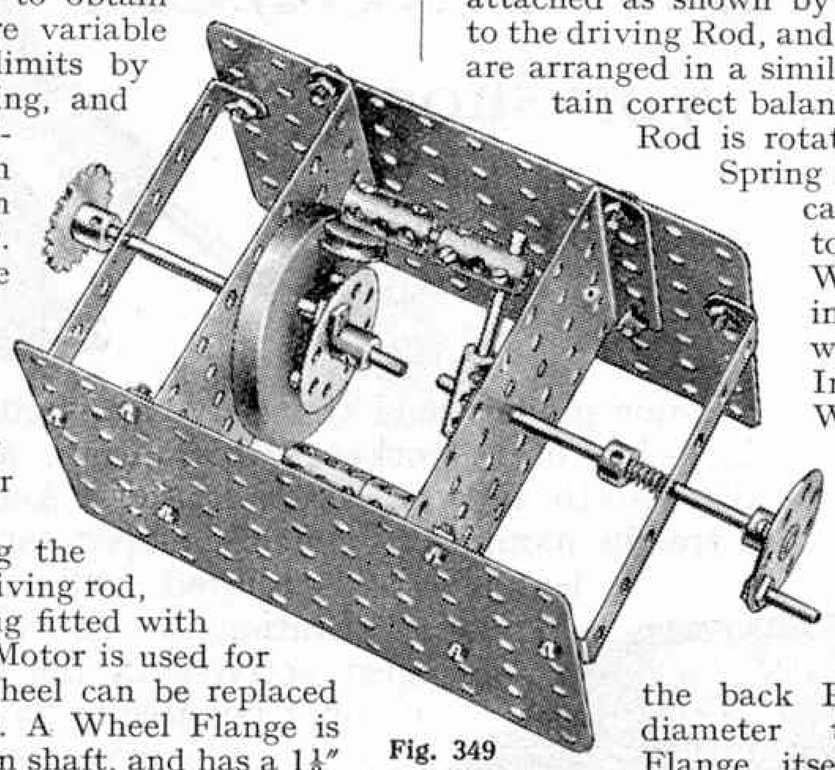


Fig. 349

The rod carrying the handwheel is the driving rod, the driven rod being fitted with the Sprocket. If a Motor is used for driving, the handwheel can be replaced by a suitable Gear. A Wheel Flange is carried on the driven shaft, and has a 1½" Strip bolted across its centre hole to keep the Rod central. This allows the wheel Flange to wobble about on the Rod, but it is prevented from rotating by a Threaded Pin carried in a Bush Wheel. On the inside of the Wheel Flange is a Collar fixed on the Rod to space the Flange away from the Flanged Plate serving as a bearing.

A ½" loose Pulley is free to turn on a ⅜" Bolt fixed in a Coupling. The Coupling is attached as shown by a further Coupling to the driving Rod, and two more Couplings are arranged in a similar manner to maintain correct balance when the driving Rod is rotated. A Compression Spring on the driving Rod causes the ½" Pulley to bear against the Wheel Flange, pressing it into contact with the back Plate. In this way the Wheel Flange wobbles on its Rod as the ½" Pulley moves round the rim. The circular path made by the Wheel Flange on the back Plate is of smaller diameter than the Wheel Flange itself, and it is the difference in size of these two circles that governs the gear ratios.

By spacing the Wheel Flange farther from the back Plate, the diameter of the path followed by the rim of the Flange is decreased, resulting in a decrease in the gear ratio. Washers can be used for spacing purposes.

(350)—Retractable Undercarriage (J. A. Rodriguez, Montreal)

Retractable undercarriages are fitted to many modern aeroplanes. The old style of undercarriage with exposed wheels offers considerable wind resistance, resulting in a decrease in the speed and efficiency of the aeroplane. The first step to minimise the drag of the undercarriage was to fit streamlined fairings over the wheels. This is still common practice, but there is an increasing tendency to design undercarriages that can be folded away out of the airstream. In some cases the undercarriage Vee struts are swung outwards so that the wheels fit neatly into recesses beneath the wings, and in others they are folded back into the engine nacelles, when the engines are fitted on the lower wings.

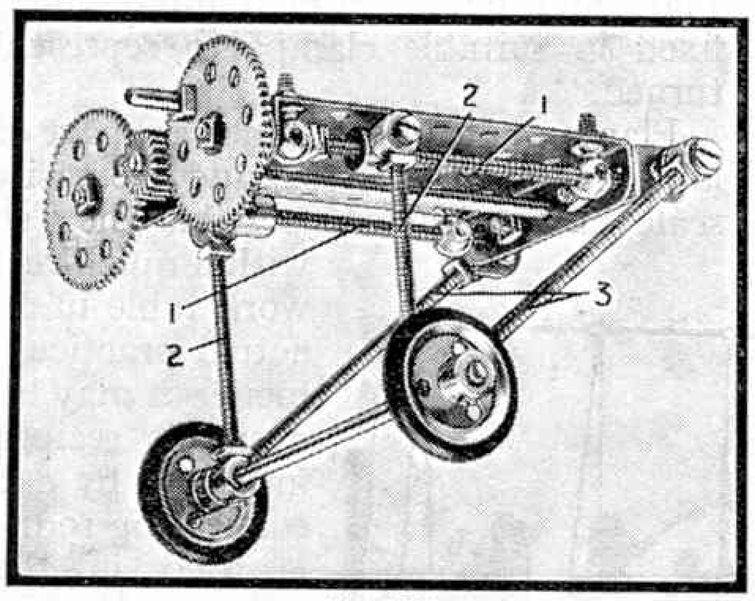


Fig. 350

In the model illustrated (Fig. 350), the front legs 2 are pivoted on ½" bolts attached to Threaded Bosses that move along Screwed Rods 1. The rear legs 3 are pivoted to a 2½" × ½" Double Angle Strip by means of Pivot Bolts. The legs 2 are secured to the Axle Rod of the landing wheels, but the legs 3 are free of the Rod.

In the position shown the undercarriage is lowered ready for landing. The Screwed Rods 1 are geared together by two 57-teeth gears and a ½" Pinion, and cause the legs 2 to move towards the legs 3 thus raising the wheels to fit into the fuselage.

A similar mechanism can be applied to wheels that draw up into the engine nacelles, but side movement of the Vee struts must be prevented.

(351)—Bell Striker or Clock Escapement (J. Tompkins, Birmingham)

The device shown in Fig. 351 was originally designed as a mechanism for striking the bell of an alarm clock, but it can be used also for a clock escapement. When used as a bell striker the Rod 2 can be provided with a Collar to serve as a hammer, or the Rod itself can be used as a striker according to requirements.

Two 1" × ½" Angle Brackets 3 are attached by Angle Brackets to the ends of a 2½" Curved Strip and engage 1½" Strips on a Face Plate. A Flat Trunnion and a Double Arm Crank are bolted to the Curved Strip, the Rod 1 being fixed in the boss of the Crank to serve as a pivot for the striker. When the Face Plate is rotated the 1½" Strips strike the Brackets 3 causing the striker 2 to oscilate to and fro. If the Face Plate is driven by a Motor the striker vibrates rapidly. The direction of rotation of the Face Plate must be anti-clockwise, and stops must be provided to limit the movement of the Rod 2.

If used as a clock escapement the device can be inverted and the Rod 2 and Flat Trunnion dispensed with. A suitable fork would then be suspended from the Rod 1 to engage the pendulum of the clock. This would be made from two 1" Rods in a Coupling fitted to the lower end of a Rod suspended from the Rod 1, or the Coupling may be attached direct to the Rod 2 according to requirements.

Miscellaneous Suggestions

Under this heading "Spanner" replies to readers who submit interesting suggestions regarding new Meccano models or movements that he is unable to deal with more fully elsewhere. On occasion he offers comments and technical criticisms that, he trusts, will be accepted in the same spirit of mutual help in which they are advanced.

(**M.188.**) **Autoflex Drive.** Belt transmission in Meccano invariably presents the problem of how to avoid slip, just as in actual practice engineers are faced with the difficulty of reducing slip to a minimum. The device known as the Autoflex Drive illustrated in the January issue of the "*M.M.*" has inspired two readers (J. Gerrard, Hardhillock by Drummoak, Kincardineshire and R. McKears, Derby) to try this form of drive transmission for preventing belt slip in models.

The idea put forward by J. Gerrard is to fix two Face Plates together by 1" Screwed Rods, carefully lining up the bosses and fitting them on the driven Rod. A 57-teeth gear is secured on the Rod between the two Face Plates, and a ½" Pinion meshing with the Gear is carried on a 1½" Rod journalled in the Face Plates. A Pulley on this Rod is driven by Cord from the power unit, and the tendency of the Pinion to ride round the Gear keeps the driving belt taut, automatically increasing the tension on the belt as the load increases.

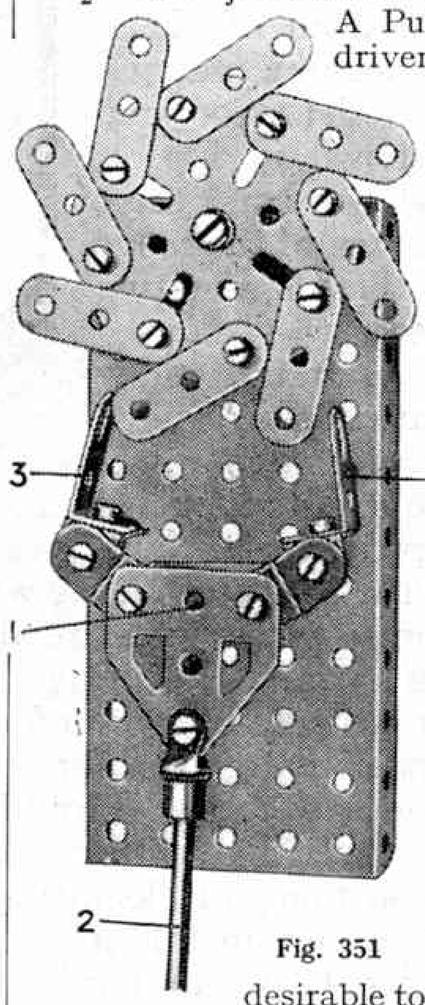


Fig. 351

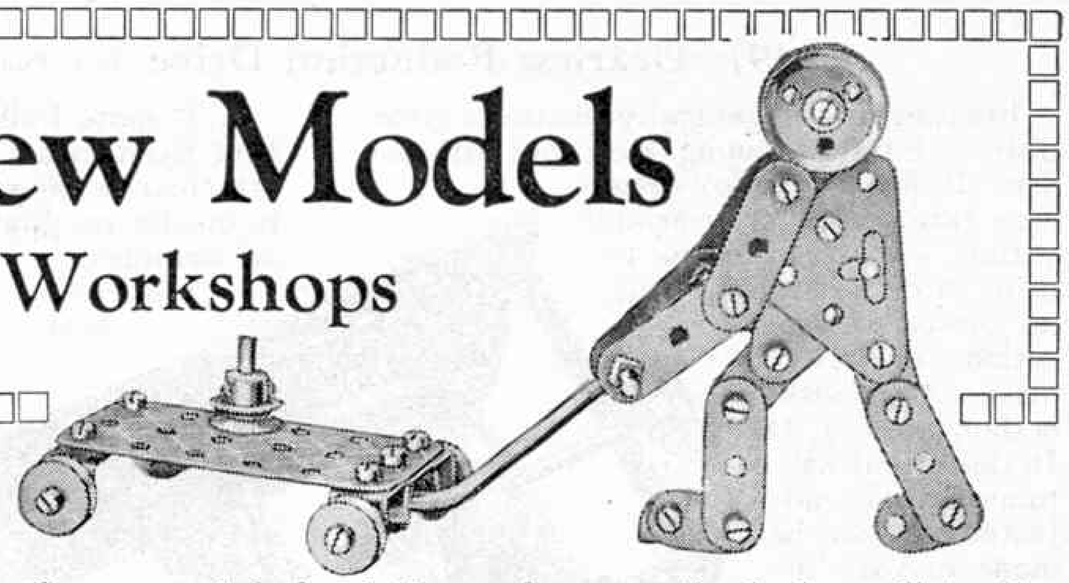
An alternative arrangement proposed by the same contributor is to use a Coupling instead of two Face Plates, the two Rods being inserted in the end transverse holes. A ½" Pinion replaces the 52-teeth Gear.

(**M.189.**) **Brake Control Lock.** With a strap-and-lever brake it is often desirable to lock the brake lever in position to maintain a certain tension on the brake band, and thus to give a constant retarding effort on the brake drum. The necessity for locking a lever in position is not confined to brake mechanisms only, however, for it occurs in many instances in model-building, especially in gear-box construction. The control lever of a gear-box must be held in definite positions for the gears to remain in or out of engagement as required.

The proposal put forward by A. Coyne (Edwinstowe, Notts.) can be applied in most cases where it is desired to lock a lever in any position, and finer control is obtained with this device than in the case when a toothed quadrant is used for the lever. A sliding Rod is connected to the end of the lever which is then controlled by a push-pull movement, and bearings for the Rod are made from a Double Bent Strip attached to a Strip or to the framework of the model. A Spring Clip is fitted on the Rod between the Double Bent Strip and the frame, Washers preventing lateral movement of the Clip. As the Rod slides in its bearings it must also slide in the Spring Clip, which grips it firmly in any set position.

In Search of New Models

Building Miniature Workshops



WORKSHOPS offer many possibilities for interesting models, and appeal just as much to the possessors of small Outfits as to those who have many parts at their disposal, for they may range from small models containing two or three machines to accurate reproductions of large fully-equipped shops. The model may be of a woodworking shop or an engineering workshop, the latter being the more interesting for a Meccano model. There are many different types of machine used in an engineering shop, and if they are reproduced on a fairly small scale, quite a large number can be incorporated in a model and driven from overhead shafting in a businesslike manner. To complete the model a roof can be provided as shown in Fig. 1.

The models shown on these pages will give an idea of the scope that is offered by these fascinating subjects. Complete workshops are shown in Figs. 1 and 2, and on close examination they will be found to differ in many respects. The first one is covered with a roof and comprises a dial press, a punching press, a drilling machine, a lathe and grinding wheels. The models are of fairly elaborate design, and are all driven from the overhead shafting carried in bearings beneath the roof. An Electric Motor provides the power for all the machines.

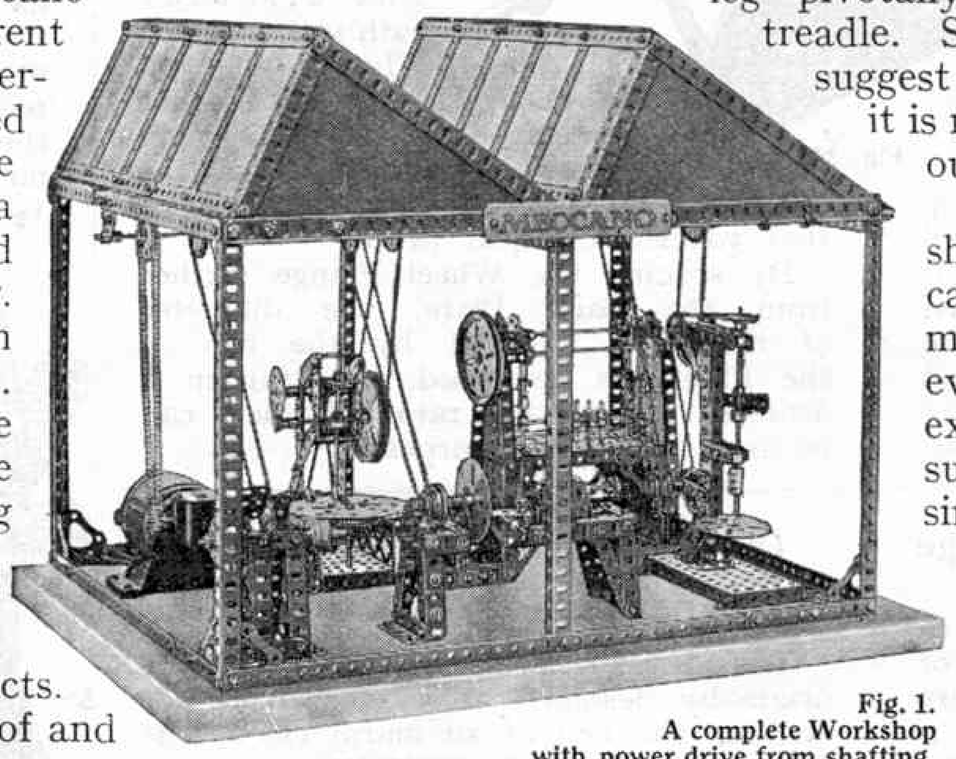


Fig. 1. A complete Workshop with power drive from shafting.

The lower model is of simpler construction, the machines being somewhat smaller and incorporating less detail. In this case there is a drilling machine, a lathe and a grinder, and in addition a blacksmith's forge and a work bench. The chief interest in this model lies in the small figures of engineers that are hard at work on their respective jobs. On the left one can be seen at a drilling machine, and in the centre is a lathe operator. Of the two figures behind the lathe one holds a part on the anvil while the other, the "smith," brings down his hammer with vigour. One of the bench workers is using a hack saw and the other a hammer, both of them being driven from the shafting.

By adding figures such as these, a model of any workshop is made much more interesting and lifelike, for we have yet to see the workshop in which all the machines operate unattended. Small Meccanitians require only a few parts in their construction, short Strips being used for this purpose with a 1" loose Pulley for the head, the four holes in these Pulleys producing a strange likeness to a face. The models in Figs. 3 and 4 show figures built on these lines working at a drilling machine and lathe respectively. On these models there is no need for any movement to be made by the figures, the models only being driven.

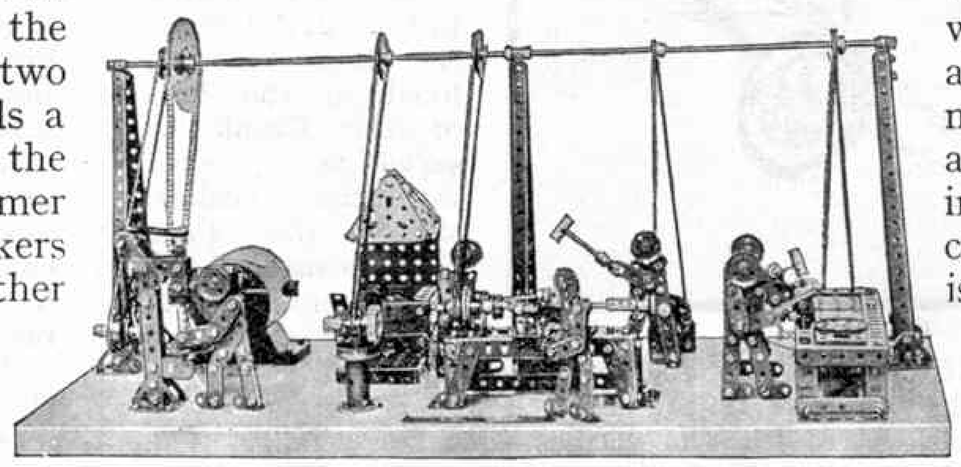


Fig. 2. In this Workshop Meccanitians carry out different operations.

Some models lend themselves particularly well to the inclusion of a working Meccanitian, as shown in the blacksmith and the bench workers. Another example is a treadle hammer in which the operator would have one leg pivotally jointed and attached to the treadle. Stationary figures do much to suggest activity in the workshop where it is not possible to have them carrying out some movement.

Equipment varies for engineering shops according to the work they carry out. A lathe and a drilling machine will be found in almost every workshop, however, and good examples of small models of these subjects are illustrated. Quite a simple lathe is illustrated in Fig. 4, the drive in this case being taken from a Pulley on the overhead shaft to a Cone Pulley on the lathe. Those who wish to build a more elaborate lathe might make one on the lines of that shown in Fig. 1. This is of the type known as a gap-bed lathe, the bed being deeper at the face plate end so that it can take work of larger diameter than can be accommodated over the bed proper. The model shown is provided with a Face Plate, and to make it more interesting a small part can be fixed in suitable clamps to represent the work being turned.

Planing machines often form part of the equipment of large engineering shops, and are easily made on a small scale in Meccano. If possible they should be provided with a quick-return motion for the work table in order to conform to actual practice, but on very small models it may be preferable to have a simple reciprocating movement imparted by a Bush Wheel and a connecting rod. This form of drive is used in the model Vertical Milling Machine illustrated (Fig. 5). The work table slides to and fro beneath the milling tool, and a small piece of wood has been cut to represent the work in this model. A coat of aluminium paint makes it look like bright steel that is being cut down by the tool.

Quite a large variety of model subjects suitable for including in a workshop are shown in the Meccano Manuals. Among this large range are examples for almost every Outfit, and, of course, the constructor need not build these exactly as shown, but can incorporate his own ideas and in many cases add a Meccanitian to provide a note of realism. The machines available for modelling include punching presses, band saws and saw benches

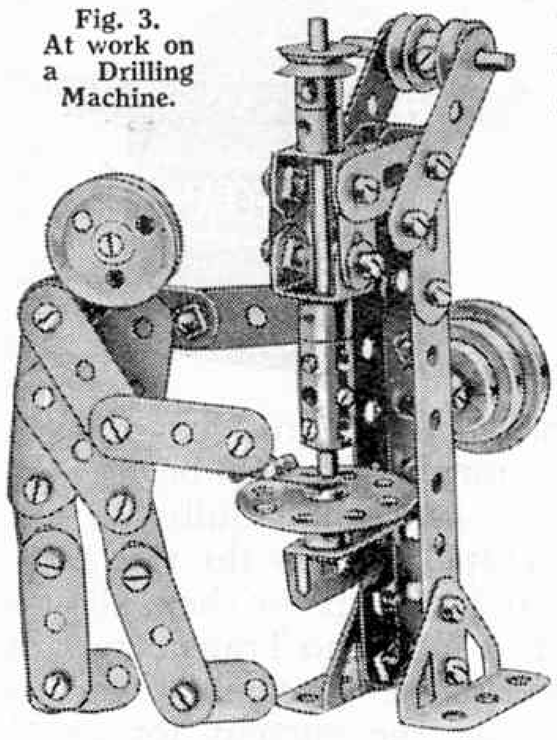


Fig. 3. At work on a Drilling Machine.

employing circular saws, mechanical hammers and stamping machines. A power hacksaw too is a useful machine tool, generally to be found in well-equipped shops.

In addition to the actual machines in the workshop a number of accessories will be required if it is to conform to actual practice. For instance, trucks are very necessary for moving parts about the shop, and an example of a small flat truck suitable for use in a model workshop is shown at the head of the opposite page. The small figure handling the truck adds to the effect. Larger trucks can be made, and in actual practice it is not uncommon for electric trucks to be used in workshops.

There is another type of truck that is generally to be found in engineering workshops. This is a truck used for handling heavy work so that it can be easily placed in position on the machines. The platform of the truck can be raised or lowered so that parts placed on it can be brought to the level of the machine and then transferred from the truck to the machine, or vice versa, with minimum difficulty. The Bale Lifter shown in the F-L Instruction Manual is of this type of truck.

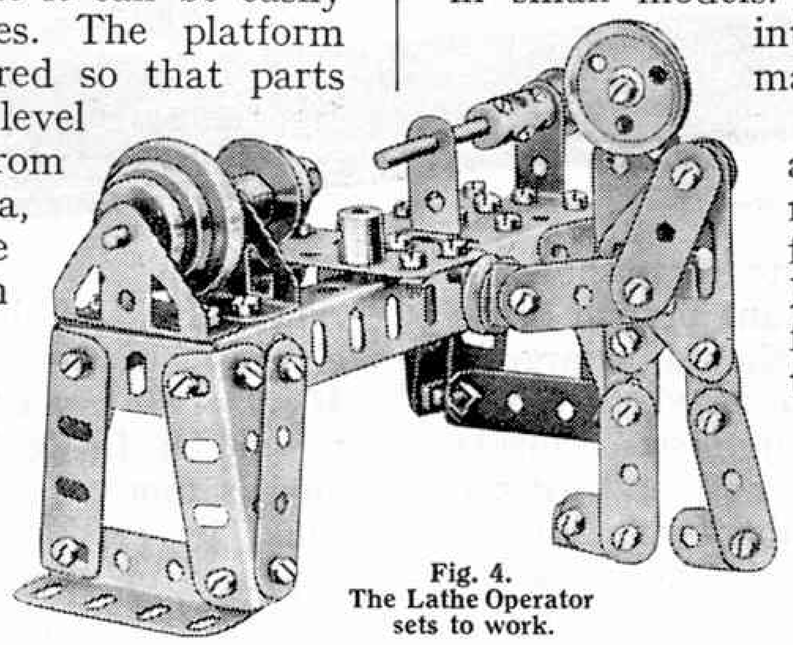


Fig. 4. The Lathe Operator sets to work.

Where the loads are too heavy for handling in this manner cranes are necessary, and these may range in size from small portable cranes, operated manually, to large gantries driven by electric motors. Where gantry cranes are employed in a building they are often arranged to run on rails high up above the machines. The usual procedure is to mount the rails against the walls along the sides of the building, and the gantry running on these rails is provided with another set of rails so that the crane trolley can move from side to side of the building. In this way the entire floor space can be covered by the crane. Such cranes as these are used only when particularly heavy loads are being handled.

The drive to the different models is one of the most interesting parts of the construction of a workshop model. In real workshops the general practice is to mount electric motors in any convenient position for driving overhead shafts, and pulleys on these shafts are connected by belts to the machines. In most cases flat belts are used and two pulleys are arranged together, one being free and the other fixed. By sliding the belt from one pulley to the other a machine can be set in motion or stopped without interfering with other machines driven from the shafts.

The model-builder will desire his model to be complete in every detail and will arrange shafting for the machines. The many Pulleys in the Meccano range make it possible to drive several machines at different speeds from one shaft. If slip occurs with cord driving, Spring Cord can be used instead, and another alternative is to use Sprocket Wheels and Chain. Although chain is rarely used for driving the actual machines in this manner, it is very useful for models and suggests the wide belts used in actual practice. Whatever form of drive is used for the machine it is advisable to employ Sprocket Chain between the Motor and overhead shaft, and as a powerful drive is necessary if a number of models are connected to the one shaft a fairly large reduction ratio should be incorporated between the Motor driving shaft and the overhead shafting for the machines.

The arrangement of the overhead shafting must naturally be governed by the disposition of the machines in the model. In fixing these to the base board the position to be occupied by the driving shaft must be considered so that no difficulties arise later when this is mounted in position. Bearings for the overhead shaft can be suspended from the roof or can be carried on supports secured down to the base board. Shafting Standards (Nos. 177 and 178) are specially designed for such use, and can be obtained in two different sizes.

In some cases machines are made as self-contained units with the motor incorporated in the machine. This practice is not easily carried out with small Meccano models owing to the size of the Motors, but the new *Magic* Motor is very suitable for incorporating in small models. The Motor is very compact and is intended primarily for use in models made with the small Outfits.

Another accessory that can be added to a model for making it more attractive is an electric lamp for illuminating the work table. The Meccano Lighting Set is available for this purpose, and the small lanterns can be used as inspection lamps as well as for mounting in suitable positions to illuminate the entire workshop. Another use for the Lighting Set occurs in the blacksmith's forge, in which red paper can be crumpled up and made to represent the fire. When a light is placed beneath it glows like a real fire.

Models made on such a small scale cannot be applied to any useful work, but a great deal of pleasure can be had from them when shaping operations are carried out on soft material such as wax. A piece of wax candle can be placed between centres on the lathe and turned like a table leg, or even made into a crankshaft. When fitted in a planing machine the wax can be shaved down to give a smooth flat surface. Fretwork drills or small twist drills can be used in a drilling machine, and a 5/32″ drill fits accurately in a Coupling that serves admirably for a chuck. In this way miniature engineering parts can be made from wax as the real parts are produced on actual machines.

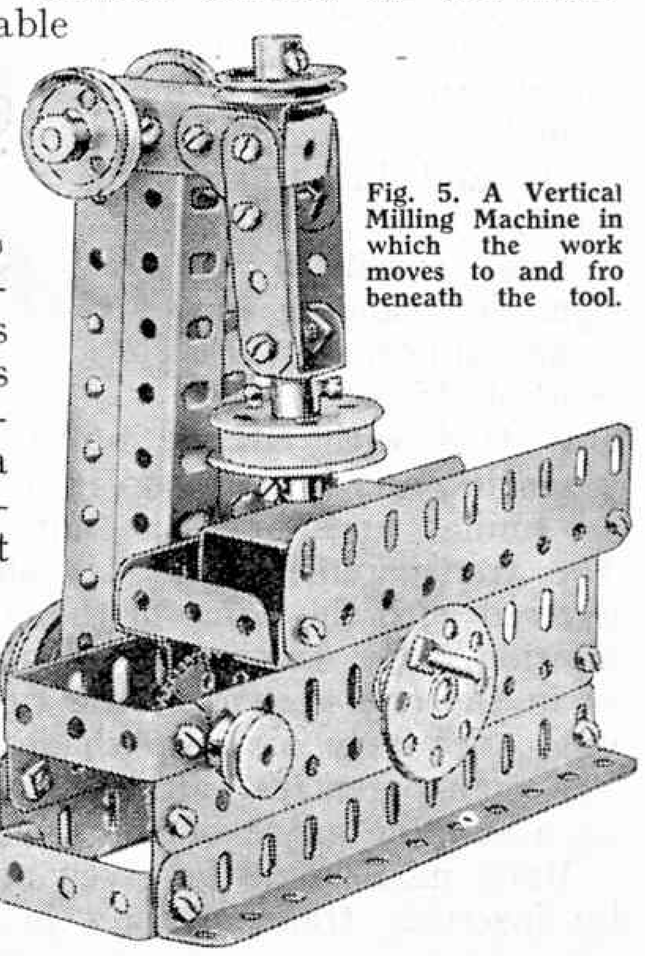
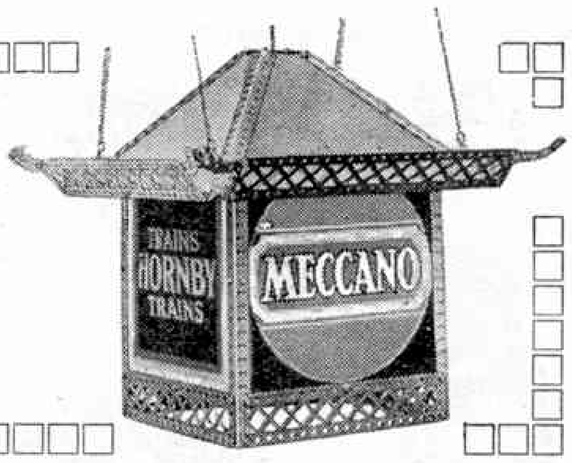


Fig. 5. A Vertical Milling Machine in which the work moves to and fro beneath the tool.



Models for Club Exhibition

Suggestions for Attractive Displays

EXHIBITIONS are important events on the calendars of all progressive Meccano Clubs. They are of great value as a means of adding to club funds, and of gaining favourable publicity that often results in the introduction of new members. A successful Exhibition increases the local prestige of a Club, but if it is to have the desired results it must be well organised, the co-operation of all members being called for to carry out the preliminary work necessary to ensure that it justifies its name. Visitors expect to see really interesting exhibits, and it is essential that they must not be disappointed.

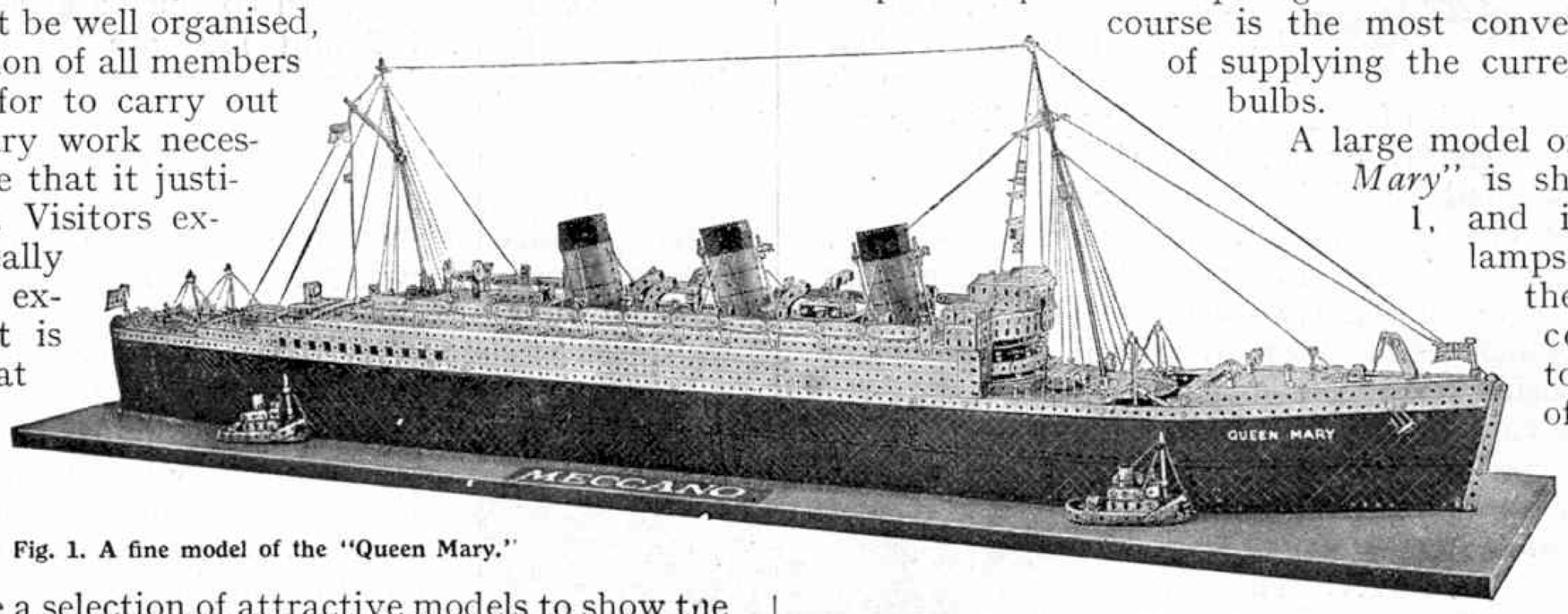


Fig. 1. A fine model of the "Queen Mary."

The first consideration is to have a selection of attractive models to show the work done by the Club in this important branch of its activities. It is not essential that these should be large in order to achieve their purpose. Well-designed models of carefully chosen subjects built with medium-sized Outfits can be just as fascinating as large ones, and simple models made by the younger members are always appreciated on their merits. Visitors generally like to know the name and age of the builders, and this information should be neatly printed on a card attached to each model.

Working models generally have a stronger appeal than those in which there is no movement, but this does not mean that stationary models should be barred entirely. Such models can often be made more attractive by the introduction of electric lighting effects; in fact, the possibilities of illuminating any model should not be overlooked, as lights add brightness to a display.

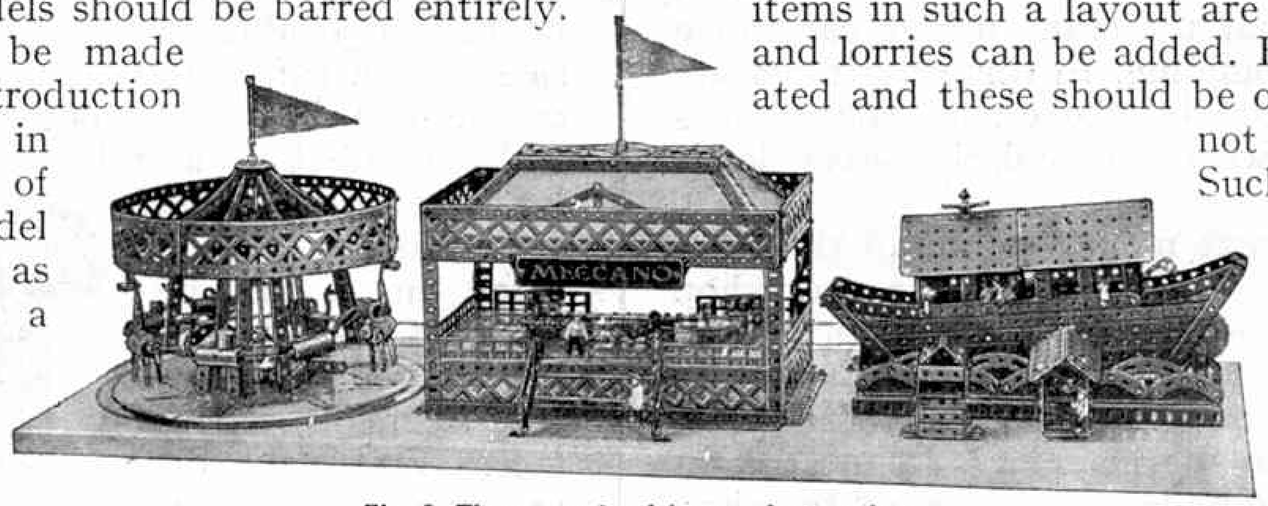


Fig. 2. Three popular fairground attractions.

Two excellent designs for hanging lanterns appear at the head of this page. They are fitted with electric bulbs and "Meccano" transparencies, and it is a good idea to hang a lantern made on similar lines over the entrance to the exhibition. The transparencies for this should be appropriately lettered with the name of the club, and the word "Exhibition." By leaving the lanterns open underneath, as in the one shown on the right above, they can be used effectively as lamp shades on the electric lights. The transparencies can be made on tracing linen or on a suitable grade of translucent paper.

Many models can be given an attractive appearance by inserting transparencies in suitable positions and placing lighted lamps behind them. A good example is shown in Fig. 4. Another refinement that could be effected with this model would be to place small bulbs on the rotating arms or on the Aeroplanes. To do this low-voltage bulbs must be used, and current for them should be picked up from a slip ring. A Meccano Transformer of course is the most convenient means of supplying the current for small bulbs.

A large model of the *"Queen Mary"* is shown in Fig. 1, and in this case lamps fitted inside the model add considerably to the beauty of its appearance. It is built approximately to scale, and many small details of the original are reproduced. In order to give an impression of the immense size of the *"Queen Mary"* two small tugs of scale size are placed alongside the model. Little details such as these help to make the models more fascinating. Other good ship models that could be used for exhibition purposes have recently appeared on the *New Models* pages of the *"M.M."*

An excellent plan for displaying model ships to advantage is to place them in a reproduction of a harbour or dock system. Docks can be made of wood and painted, and can then be provided with models of the usual machinery and equipment for the handling of cargoes. The principal items in such a layout are cranes, and small trucks and lorries can be added. Bridges may be incorporated and these should be of the opening type so as not to obstruct shipping. Such bridges may be made to work automatically for opening and closing continuously.

The Tower Bridge is shown in model form in Fig. 3. This could be used in a dock system for carrying a road over a busy waterway. An Electric Motor operates the bascules, raising and lowering them continuously. On models such as this, representing a definite prototype, the proportions of the original should be maintained, and as far as possible the models should be built to scale. The chief features should be reproduced, together with as much of the small detail work as the size will allow. Small models naturally offer less scope for the reproduction of the finer details than large models, and in these correct proportioning must be relied upon to identify the structure.

Dinky Toys can be used on the bridges to strike a note of realism. Alternatively the bridges may form part of a

railway system, and clubs having a Hornby Railway section are able to combine Meccano and Hornby Train displays with excellent effect. Sidings may be laid on the dock system mentioned above, and there is a choice of a large range of bridge types for carrying the line over rivers and roads. Other ways for combining Meccano and Hornby Trains will readily suggest themselves. Models can be built of any of the engineering structures of a real railway, including wagon tippers, locomotive coaling plants, and cranes of many types. A steam shovel may be set in surroundings to represent excavation work and a train of wagons arranged to take away excavated material. Another model suitable for use with a railway is the Ship Coaler, which may be fed by coal wagons from the Railway System. The super model Travelling Bucket Dredger can be made to load up wagons, with loose material such as gravel, and in a miniature railway goods yard cranes for loading and unloading operations, motor lorries and small electric trucks can be included.

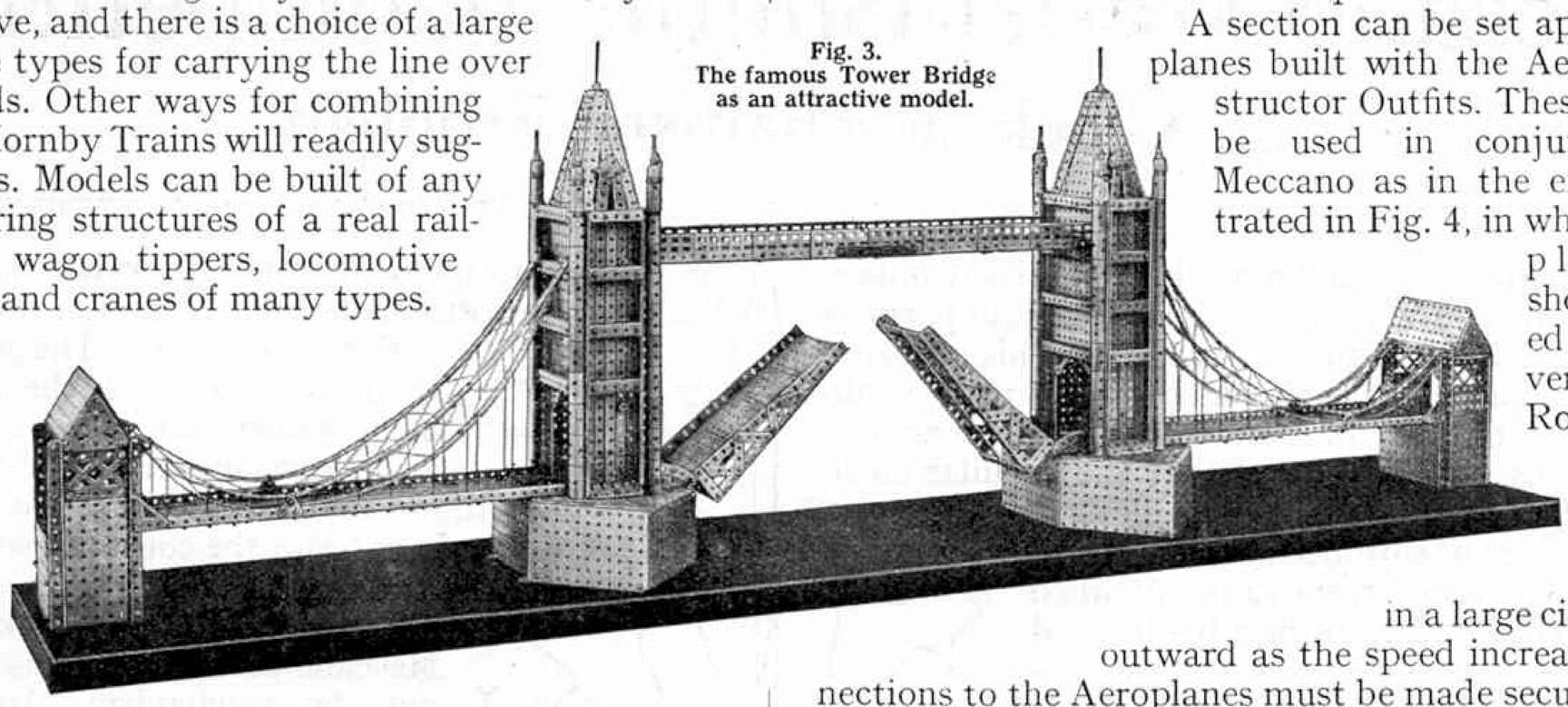


Fig. 3.
The famous Tower Bridge as an attractive model.

Amusing models are a welcome variation from the more serious engineering structures, and have the advantage that they generally require fewer parts. Some of the very simple models of this kind shown in the Manuals for small Outfits, especially the small figures that exhibit weird movements when carrying out different operations, never fail to cause laughter. Suitable models in the Manuals show Wrestlers, Acrobats, Gymnasts, and Horsemen in various attitudes. Animals as model subjects invariably attract attention owing to their unusual character, and as a rule their strange appearance has a humorous appeal.

A fascinating model of fairground attractions is shown in Fig. 2. On the left is a Roundabout, with horses and other peculiar animals and birds. Next to it is a representation of the thrilling form of amusement known as "The Whip," the cars being hauled along by a chain and swung rapidly round a wheel at each end of the platform. The model of the Ark on the right rocks from end to end, and as it does so strange animals poke their heads out of the windows. These are mounted on Springs and in some cases provided with a Spring for a neck so that they move about in a lifelike manner. One Electric Motor drives all three models by means of Sprocket Chain.

Many other fairground attractions make good subjects for models. They need not be elaborate to be effective as it is the movement of these subjects that makes them so fascinating. There are a number of varieties of roundabout, some having animals, others cars, and many having a combination of both. The animals can be made to jump up and down, and the cars to revolve. Cake Walks are well known and are easy to build. They may be provided with small figures, perhaps Dinky Toys, mounted on springs to give them movement when the model operates.

A section can be set apart for Aeroplanes built with the Aeroplane Constructor Outfits. These models can be used in conjunction with Meccano as in the example illustrated in Fig. 4, in which the Aeroplanes are shown suspended from universally jointed Rods. As the upper structure rotates, the models "fly" round in a large circle, swinging outward as the speed increases. The connections to the Aeroplanes must be made secure to prevent them from becoming detached and causing damage, and the speed should not be allowed to rise too high.

Models of this nature are often driven through Worm gearing, but if this form of drive is used a free wheel or friction clutch must be incorporated to prevent damage to the gearing when the Motor is stopped, for the inertia of the rotating structure causes it to over-run the motor when the latter is switched off.

One of the most popular models at Exhibitions is the Meccanograph. This ingenious mechanism produces an endless number of attractive designs merely by turning a handle, and is always a source of great pleasure to visitors, who may be allowed to turn the handle and make their own designs. Specimen designs should be exhibited with the model. Some of them can be improved by artistic colouring and the formula for producing each design should be indicated on it so that a visitor can readily make any one he wishes. The Meccanograph can be a useful means of increasing funds by making a small charge, say one penny, to visitors who wish to produce their own design.

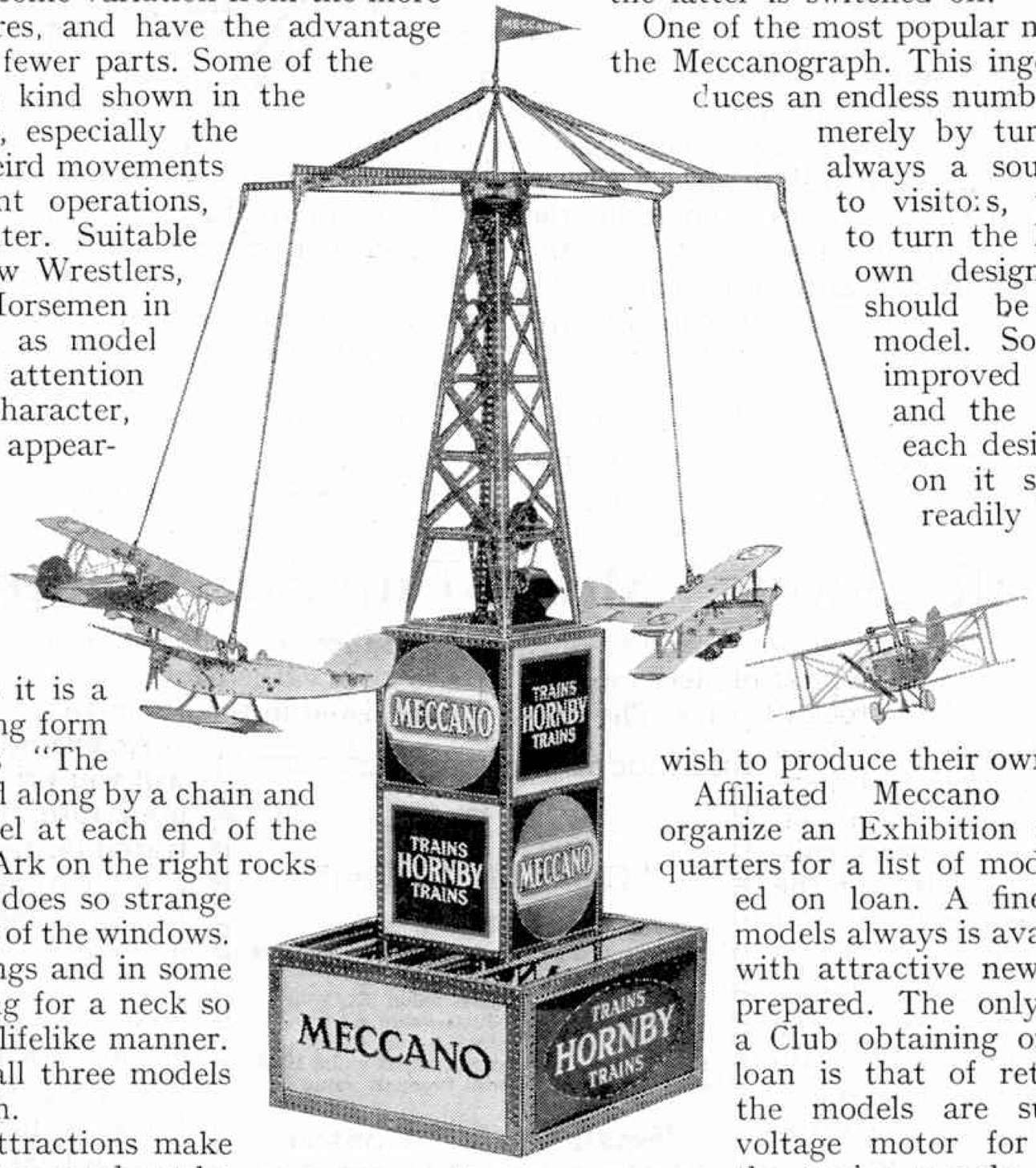


Fig. 4.
Revolving Aeroplanes on an illuminated base.

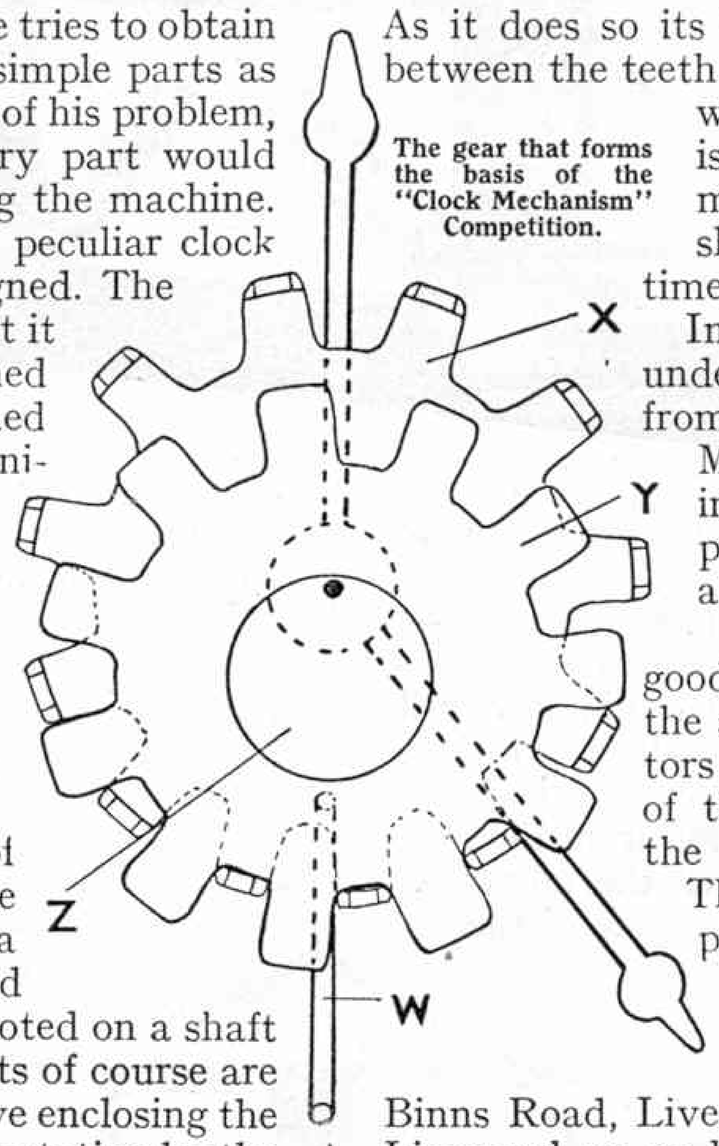
Affiliated Meccano Clubs proposing to organize an Exhibition should write to Headquarters for a list of models that can be obtained on loan. A fine selection of working models always is available and a revised list with attractive new models has just been prepared. The only expense incurred by a Club obtaining one of these models on loan is that of return carriage. Most of the models are supplied with a high-voltage motor for direct connection to the mains supply, but in certain cases 6-volt Motors can be installed when mains current is not available. The models can then be operated from an accumulator.

With the concentrated efforts of members, and this useful assistance from Headquarters, a successful Exhibition is assured.

Meccano Model-Building Competitions

A Clock Mechanism Problem

When a real engineer builds a machine he tries to obtain the results he desires with as few and as simple parts as possible, and this is often the greatest part of his problem, especially when even a single unnecessary part would greatly increase the cost of manufacturing the machine. It was with this object in mind that the peculiar clock mechanism shown on this page was designed. The interesting feature of this mechansm is that it enables the same speed ratio to be obtained with only two gears as is ordinarily obtained with four gears, and on account of its ingenious nature it has been selected to form the basis of one of this month's model-building competitions.



The gear that forms the basis of the "Clock Mechanism" Competition.

A range of fine prizes is offered for the most ingeniously designed reproduction, using only Meccano parts, of the mechanism. This consists of two gear wheels X and Y. The former has 12 teeth that are bent at right angles, in a similar manner to those of a Meccano Contrate Wheel, and the minute hand is attached to its shaft. Within it is a second gear wheel Y, which has 11 teeth and is mounted on an eccentric Z, which is pivoted on a shaft carrying also the hour hand. The two shafts of course are concentric, and one could be a tube or sleeve enclosing the other. The gear wheel Y is prevented from rotating by the rod W, which is attached to it, and at its lower end moves up and down in a slot in the framework carrying the entire mechanism. This framework is not shown in the diagram.

As the shaft on which the eccentric is pivoted rotates, the gear Y is not rotated, owing to the action of the rod W, but instead is lifted upward and then allowed to fall. As it does so its teeth are withdrawn from the spaces between the teeth of the gear X, and in each case engage with the next space. The gear X therefore is rotated, and with the tooth arrangement shown, its speed and that of its shaft carrying the minute hand is 12 times that of the first shaft.

In entering the contest it should be clearly understood that only two gears built up from Strips, Angle Brackets or other Meccano parts must be used in reproducing the mechanism. Any number of parts, however, may be used in making a suitable framework.

Competitors need only send either a good drawing or a photograph of the model; the actual model is not required. Competitors are advised to prepare a description of their mechanisms and enclose it with the photograph or drawing.

There will be one section only and competitors of all ages, living in any part of the world are eligible. Entries should be addressed to "Clock Mechanism" Contest, Meccano Ltd., Binns Road, Liverpool 13, and must be posted to reach Liverpool on or before 30th June, 1936. The prizes to be awarded for the most ingenious entries received are listed in the panel at the foot of this page.

Photographs or drawings of models that win prizes become the property of Meccano Ltd., but unsuccessful entries will be returned to the senders provided that a stamped addressed envelope of the necessary size is enclosed for that purpose.

"Small Outfits" Model-Building Competition

This competition provides readers who possess only small Outfits with a chance to win a prize of Meccano products and thereby increase their stock of parts. The contest is open to competitors of all ages living in any part of the world, and there are no fees to pay or forms to fill in. Competitors may choose whatever subject they like for their models, but the models must be built with an Outfit not larger than an F or one of the old No. 3 Outfits. Readers who possess larger Outfits than these may take part in the Contest provided that their models do not contain any parts not included in an F or No. 3 Outfit. Competitors may use Clockwork or Electric Motors to drive their models if necessary.

It is far more difficult to build a good model with a small Outfit than it is when one is allowed to use an unlimited number of parts, and competitors therefore should take care to choose a good subject and then reproduce it as neatly as possible. The fine prizes to be awarded for the most interesting models received are listed in the accompanying panel.

The Prizes

"Clock Mechanism" Contest

The prizes to be awarded in this Contest are as follows:

1st, Meccano Products value £3/3/–.
2nd, Meccano Products value £2/2/–.
3rd, Meccano Products value £1/1/–.
Five Prizes of Meccano Products value 10/6.
Five Prizes of Meccano Products value 5/–.

"Small Outfits" Contest

The prizes to be awarded in each section of this Competition are:

1st, Meccano Products value £2/2/–.
2nd, Meccano Products value £1/1/–.
3rd, Meccano Products value 10/6.
Ten Prizes of Products value 5/–.

Certificates of Merit will also be awarded in each section.

An example of the kind of models that will win prizes in this Contest is the fine miniature motor-cycle and sidecar illustrated on the opposite page. This model is built from an Outfit C with the addition of a Magic Motor, and it won a prize in direct competition with larger models.

It should be noted that it is not necessary to send the actual model. A photograph or a good drawing is suitable.

Entries will be divided into two sections: A for competitors living in the British Isles, and B for competitors living Overseas. Entries should be addressed to "Small Outfits" Contest, Meccano Ltd., Binns Road, Liverpool 13, and those for Section A must reach Liverpool before 30th May, 1936. Overseas closing date, 31st July, 1936.

Model-Building Contest Results

By Frank Hornby

Ingenious Work by Overseas Competitors

"Autumn" Competition (Overseas)

The awards in the Overseas Section of the "Autumn" Model-Building Competition are as follows:

1ST, Meccano Products value £3/3/–: E. Aronsan, Hedmora, Sweden. 2ND, Products value £2/2/–: H. Stapleton, Wanganui, New Zealand. 3RD, Products value £1/1/–: D. Thomas, Victoria, B.C., Canada.

Products value 10/6: D. Graham, Edmonton, Alberta; W. Bladergroen, Amsterdam; F. Dressler, Breslau, Germany; V. Boned Gil, Barcelona; G. Bosch, Wyk-Maestricht, Holland.

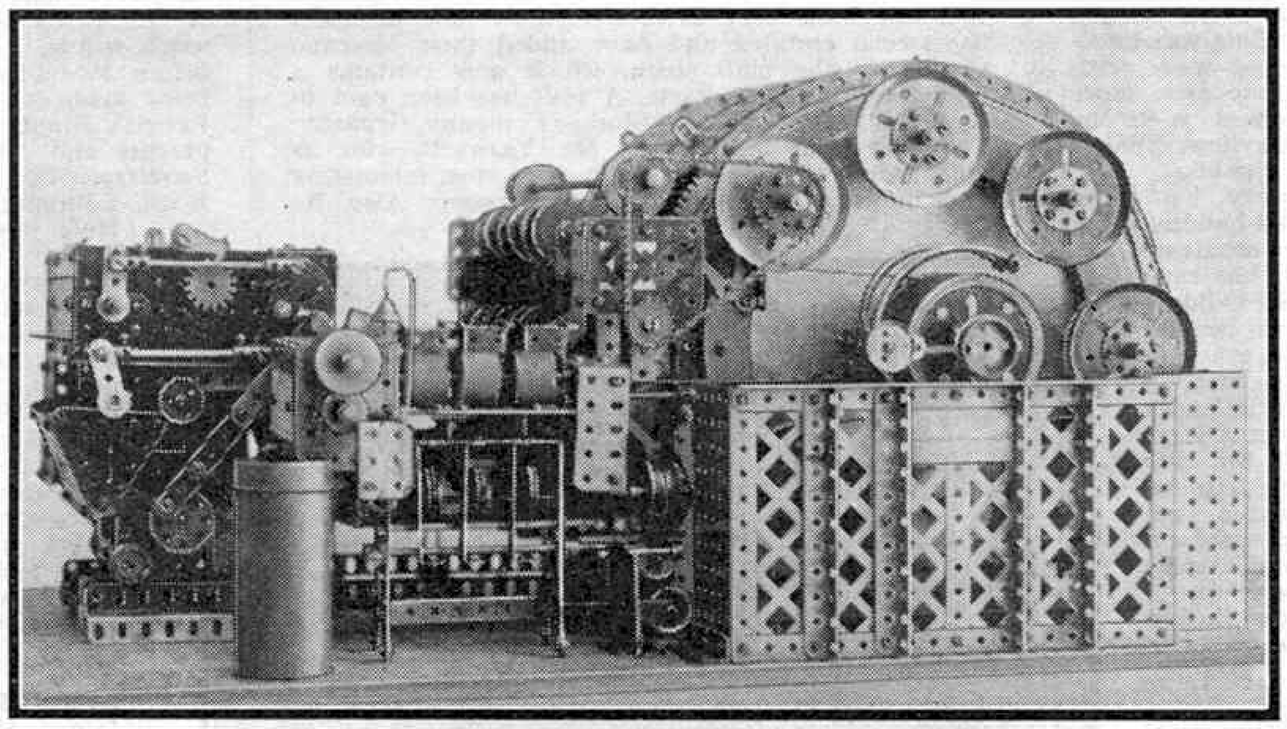
Products value 5/–: E. Lipkin, Johannesburgh; T. Bates, Jamaica; J. Van Vollenhoven, Bussum, Holland; F. Ling, Halifax, N.S., Canada; D. McLeod, Natal, S. Africa.

Competitors in *"M.M."* competitions are constantly being advised to make their models as simple as possible, and to avoid using a lot of unnecessary parts, which only make a model complicated and detract from its appearance. The model that won First Prize in the "Autumn" Contest testifies to the soundness of this advice, for it owes its success almost entirely to its simple construction. The model, a motor-cycle and sidecar, is illustrated on this page. It is built with Outfit C and is driven by a Meccano Magic Motor, which forms the main part of the frame of the cycle. The drive is taken by means of a Rubber Driving Band to a 1″ fast Pulley on the axle of the rear wheel, and the Motor thus drives the model along the ground in a realistic manner. The body of the sidecar is made from two Flanged Sector Plates and a 1½″×2½″ Flanged Plate, and Flexible Plates are used for filling-in purposes. In my opinion the model, which was built by E. Aronsan, is a very fine piece of work for such a small Outfit and well deserves the prize it was awarded.

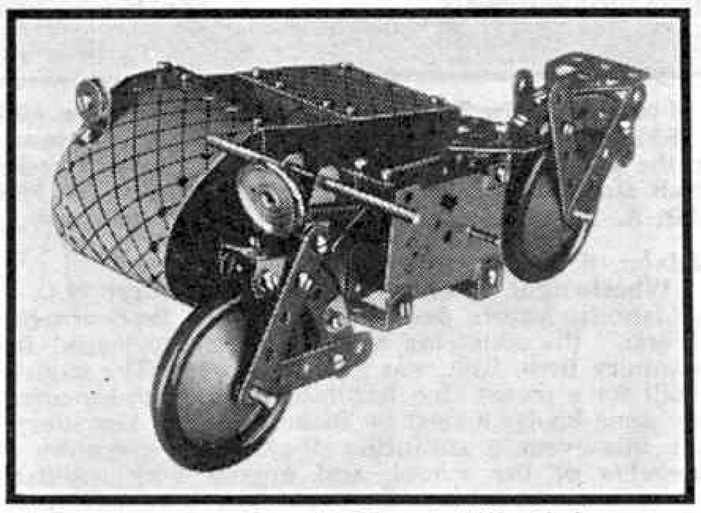
A large dragline is the subject of the model submitted by H. Stapleton, which was awarded Second Prize. The jib is sturdily built from Strips, and at its lower end rests on a ball race made from two 3″ Pulley Wheels with Steel Balls interposed between them. The jib carries the operating cords to the end of which the drag-bucket is attached, and the power of the E1 Electric Motor that drives the model is distributed by means of a gear-box, which has controls for bringing the various movements of the machine into operation as required.

On page 106 of the February 1931 *"M.M."* is illustrated a locomotive fitted with a crane. This locomotive was chosen by D. Thomas as the subject for his entry in this Contest. I have compared the photograph that Thomas submitted with the *"M.M."* illustration, and apart from one or two minor points there is little to criticise adversely. In the model the driving wheels are eight 3″ Pulleys coupled together by means of Strips, and to the cylinders by a Rod. The crane is made from Angle Girders and Plates and swivels on a ball race built up in a similar manner to that used in Stapleton's model dragline already mentioned, and is mounted on the tops of the water tanks of the locomotive.

Among the winners of Meccano Products value 10/6 I was attracted by a model seismograph by W. F. Bladergroen. This competitor has made several successful seismographs in the past and won a prize for a model of this kind in a previous contest. The present model is excellently constructed, and is so delicately adjusted that it is sufficiently sensitive to register the vibrations produced when a person walks across a room in which it is located.



A fine wool carding and condensing machine built by A. Ledent, Ruplemonde, Belgium.



This neat motor-cycle and sidecar built by E. Aronsan, won First Prize in the "Autumn" Contest.

"September" Competition (Overseas)

The prizes were awarded to the competitors named in the following list:

1ST, Meccano Products value £3/3/–: A. Ledent, Ruplemonde, Belgium. 2ND, Products value £2/2/–: K. van Dommelen, Antwerp. 3RD, Products value £1/1/–: J. Wicht, Buenos Aires.

Goods value 10/6: J. Reade, New Zealand; R. Kett, Melbourne; E. Driver, Auckland; D. Uullicla, Calcutta; J. Ancell, Christchurch, New Zealand.

Goods value 5/–: R. Latimer, Rangoon; E. Azzopardi, Sliema, Malta; A. Butcher, Canterbury, New Zealand; J. Capelli, Buenos Aires; D. Murison, Buenos Aires.

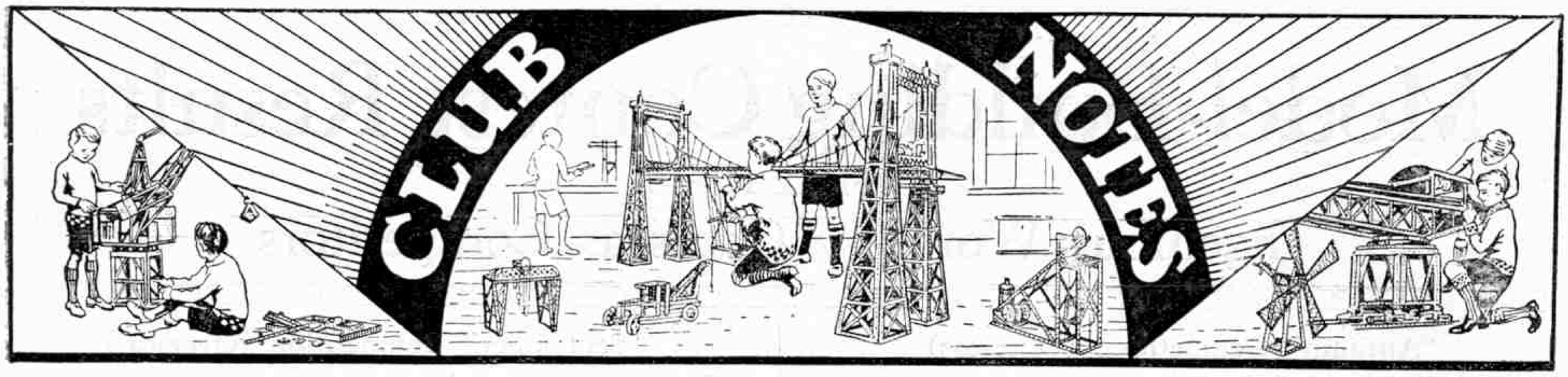
The First Prize entry in this Contest is the model wool carding machine illustrated on this page. Machines of this kind are used in the wool industry for combing out the raw material and straightening the fibres, which are then condensed or twisted together to form rough thread. The model was built by A. Ledent and works as follows. The raw wool is fed into a box-like structure on the left-hand side of the model. From there it is taken up by fluted rollers and conveyed into the machine, where it is subjected to the combing action of a number of stiff wire brushes that revolve at high speed inside a large drum. From the drum the wool is fed between grooved rollers, which serve the purpose of separating and twisting the short fibres into the form of coarse thread, which is then collected on a spindle. Readers who are interested in textile machinery should refer to page 178 of the March 1935 *"M.M.,"* in which are described several other models of this kind.

A large model of a universal excavating machine won Second Prize for K. van Dommelen. The model found favour with the competition judges not because of its huge proportions or the amount of work attached to its construction, but because Dommelen has paid great attention to details and neat workmanship. The model reproduces a bucket type excavator, and runs on Hornby Rails. The upper structure is mounted on a Meccano Roller Bearing, and a truck loaded with ballast travels along it to balance the weight of the bucket arm as it is raised or lowered.

A model of the French liner *"Normandie,"* which incidentally is the first really good model of this ship that has yet been submitted for a model-building competition, was entered by J. Wicht and won Third Prize. Apart from generally neat construction there is little out of the ordinary in the model. The hull is 7 ft. in length, and the height of the model from water line to upper deck is 11 in.

Among the models that won the smaller prizes is a reproduction of H.M.S. *"Leith."* It was entered by E. Driver, and is built with only simple parts. If Driver had taken a little more care over the rigging and deck work of the model I feel sure he would have received one of the larger prizes.

The model sent by R. Kett is interesting, but it would have been more suitable for a "Realism" Contest. The photograph submitted shows a model steam-navvy at work in a sand pit, and the whole scene is remarkably realistic. The model is quite well built, but the good work done in the making of realistic surroundings did not count in an ordinary model-building contest.



Snape M.C.—The club continues to make good progress and the membership is steadily increasing. Mr. Reeve, the local schoolmaster, recently asked the club to provide a model for use in a school play. His request was complied with enthusiastically, and a model worthy of the occasion was constructed. Boxing, Table Tennis and other games are played occasionally as a diversion from model-building. During the winter a cup of cocoa was given to each member at the close of meetings, and this was much appreciated. Ambitious plans are being made with a view to making the club programme even more attractive. A Table Tennis Tournament is to be held. Club roll: 22. *Secretary:* W. Mayhew, "Sandpit Cottage," Snape, Saxmundham, Suffolk.

St. Stephens (Saltash) M.C.—Variety has been introduced into some of the Model-building Evenings by fixing a time limit for the construction of a particular type of model. It has been found that this not only makes model-building very exciting by speeding it up, but enables the latter part of the meetings to be spent in interesting games or discussions. At one meeting the outstanding model was a crane 3 ft. in length and operated by a Meccano No. 2 Motor. A large model of a bridge is being built with the club stock of Strips, Flat Plates and Angle Girders. The Model-building Section now possess a Tool Set, and they are busy making three cabinets for the storage of the club's Meccano and Hornby stock and other model-building materials. A miniature Goods Depot and a Terminus Station 7 ft. in length will be made when the cabinets are completed. Club roll: 16. *Secretary:* B. Braund, 9, Horner Park, Saltash.

Burnley Grammar School M.C.—Several exciting club Competitions have been held. In one of them the competitors were required to build original models in which every angle had to be a right-angle; and in another models had to be constructed with Wheels, Collars, Axle Rods and Couplings. On another occasion the competitors were given certain Meccano parts and asked to produce the best model they could in half an hour. The results of these contests have often been surprising, and have revealed remarkable ingenuity on the part of the model-builders concerned. An interesting visit has been paid to the factory of Morris and Wilkinson Ltd., Burnley, where the various processes by which "Beatall" metal ware are produced were shown and explained to the party. The tour lasted three hours, and was afterwards voted one of the best outings the club has had. Club roll: 22. *Secretary:* J. S. Keighley, Grammar School, Burnley.

Claremont Avenue School (Kenton) M.C.—Members have been busily engaged in printing posters and making drawings for the club Exhibition. Attractive Dinky Toy and Hornby layouts have been planned, and an effort is being made to devise many novel Meccano models for the occasion, so that the display will be a really outstanding one. Club roll: 14. *Secretary:* G. Furton, 5, Brookfield Crescent, Kenton.

Plymouth M.C.—A special service was held in memory of the late King, and the St. Stephens (Saltash) M.C. accepted an invitation to attend. A talk on the "*Flying Flea*" has been given by Mr. Dingle, the Leader of the St. Stephens club, and was much appreciated. The coxswain of the Plymouth life-boat, an express engine driver who has retired, and other interesting local people have consented to give talks in the near future. When the Meccano Section recently chose "Heath Robinson" railway models as a subject for model-building they not only created a novel change from ordinary models, but became involved in an amusing and very wordy controversy with the Hornby Section. The latter Section continue to provide excellent layouts and track operations, and their persistent clamour for more rails is gradually being satisfied. A Motor Car Section has been formed for the benefit of members who possess Meccano Motor Car Outfits, and is making rapid progress. A lantern lecture has been arranged. Club roll: 70. *Secretary:* R. G. Symons, 47, Lisson Grove, Mutley, Plymouth.

Dagenham M.C.—Mr. Baker, the President, attended the opening meeting last session and addressed the club. Outstanding models built at recent meetings have been a Traction Engine and a Big Wheel. Games and discussions are very popular. Arrangements are being made for a tea party. Club roll: 12. *Secretary:* J. Robinson, 17, Freshwater Road, Dagenham, Essex.

St. James' (Grimsby) M.C.—Members recently built a large model of a derricking crane. It had a four-movement remote controlled gear-box, and was operated by a steam engine. Great enjoyment was derived from working the crane, and many interesting operations were carried out before it was reluctantly dismantled. D. Allen has been busy repainting the club's old Meccano Parts, and future models will therefore look very attractive. Two new members have been enrolled and have added their Meccano Outfits to the club stock, which now contains a very large range of Parts. A visit has been paid to the Standard Ice and Cold Storage Company, Grimsby. The party was received by Mr. Yarworth who, as guide, made their tour of the factory most interesting and informative. Club roll: 6. *Secretary:* Alan N. Dixon, 65, Yarborough Road, Grimsby.

A group of officials of the Zagazig (Egypt) M.C., which was affiliated in October 1935. The President of the club is Mr. R. Mansour, who is seated on the left, and next to him is Mr. R. S. Yousif, Vice-President. The officials standing are (from left to right): Mr. A. M. Mangourie, Leader; Mr. A. Y. Auble, Secretary, and Mr. I. A. Ashmawy, Auditor.

Wheelwright Grammar School (Dewsbury) M.C.—A lantern lecture describing "*A Visit to Bournville Works*," the slides for which were kindly loaned by Cadbury Bros. Ltd., was greatly enjoyed. The models built for a recent club Exhibition were supplemented by some kindly loaned by Bickers Ltd., of Dewsbury. At this event a conjuring display was given by a member of the school, and proved very popular. A visit to Dewsbury Gasworks has been arranged. Club roll: 14. *Secretary:* D. G. Thackrah, 2, Highroyd, Northfields, Dewsbury, Yorks.

Well Hall and District M.C.—Cycling and Photographic Sections have been formed, and seem likely to be very popular. The establishing of a club library is under consideration, and each member has been invited to contribute a few books to form the basis of the library. A suggestion that a summer camp should be held this year has been received with enthusiasm. Club roll: 8. *Secretary:* E. Quinton, 48, Beaconsfield Road, Mottingham, Kent.

Gate House School (Ingatestone) M.C.—A successful Exhibition has been held in the club-room, and the models displayed included cranes, tractors and a jazz band. Short plays were given, and other attractions were a Waxwork Show and a Fretwork Display. The event was rounded off by an excellent supper. Saturday afternoon meetings have been devoted either to Model-building, Boxing bouts or short Walks. There have been more indoor meetings than usual owing to the wet weather frequently preventing outdoor sports. *Secretary:* E. Bull, Gate House School, Ingatestone.

St. Giles Cathedral (Edinburgh) M.C.—Speakers at the monthly services have included Mr. Ernest Brown, Minister of Labour, and Mr. Herbert Reid, the well-known author of stories for boys. Important additions have been made to the club's large stock of Meccano. A visit to the Scottish Motor Show at Glasgow was much enjoyed, and provided some useful ideas for future Model-building Evenings. Signal frames are being made for the club's Hornby layout. A recent Parent's Night was well attended, and 145 members, parents and friends were present. Club roll: 180. *Secretary:* D. Ashbrook, "Neantana," Corbiehill Road, Edinburgh 4.

Holy Trinity (Barnsbury) M.C.—Members are very busy preparing for an Exhibition, and every endeavour is being made to ensure that it shall surpass all previous events of its kind. A successful concert has been held. Club roll: 34. *Secretary:* H. C. Boys, 12, Stonefield Mansions, Cloudesley Square, Barnsbury, London.

Regent St. Central School (Heywood) M.C.—About 70 members took part in an excursion to Belle Vue Circus, which was greatly enjoyed. An interesting lecture on "*Iceland; its inhabitants and their habits*" has been given by one of the teachers at the school, and another teacher gave a most interesting lecture about "*Miserícordes*," which are carvings under the seats in the choir stalls of old churches. Club roll: 150. *Secretary:* R. Nobbs, 6, Broadfield Street, Heywood.

Kendal M.C.—An excellent club-room has been obtained. The club has been re-organised and now looks forward to making good progress. A visit to Headquarters is being planned, and an interesting programme drawn up for the summer months. Club roll: 12. *Leader:* L. Haslam, Middleton, Kirkby Lonsdale, Carnforth.

S. Oswalds (Norbury) M.C.—Considerable time has been devoted to Model-building, and splendid models of bridges and motor cars have been completed. A lantern lecture describing "*Beautiful Manxland*," the material for which was kindly loaned by the Isle of Man Publicity Board, was greatly enjoyed. A club library is being organised. It has been decided to look out for a new club-room, as the present one is too extensive and leaves no club funds available for buying additional model-building materials or financing summer outings. The club football team has had a very successful season. Club roll: 15. *Secretary:* R. H. Smart, 14, Kensington Avenue, Thornton Heath.

Anderson Baptist M.C.—This club has resumed activities after having been suspended for several months owing to the serious illness of the Leader. It is hoped to hold regular weekly meetings, and to arrange an interesting summer programme. At present most meetings are devoted to model-building. Club roll: 15. *Secretary:* A. C. Kimber, 15, Regent Street, Reading.

Hornsea M.C.—A visit has been paid to the works of the East Hull Gas Company, where the party were very interested in the huge vertical retorts and the pumping and purifying plants. Finally they were taken into the engine house. The Engineers Sections of the club are to visit a local power station. Club roll: 14. *Secretary:* P. Thom, 5, Alexandra Road, Hornsea.

EGYPT

Zagazig M.C.—In a recent lecture the President reviewed the history of the club, and in another one the Leader dealt with the "*Object of Meccano Clubs.*" Recent outdoor events have included Rambles, Fishing expeditions and Excursions to scattered villages in the district. At one village special donkeys were provided to convey the party to the chief's house, where they were entertained. A moonlight trip on the Moise Canal was very much enjoyed. New Year celebrations included a tea party in the club-room. Club roll: 18. *Secretary:* Aube Yousif Auble, Gannabiet Sikka Hadid Avenue, Zagazig.

INDIA

Kognolkar M.C.—Competitions have added to the interest of Model-building Evenings, and have included a Meccano "Animals" Contest and one concerning Bridges. A local railway workshop has been visited. The Leader recently gave a lecture on "*Meccano and its Advantages.*" Club roll: 13. *Secretary:* R. M. Kognolker, Nowgong, C.I.

Planning a Summer Camp

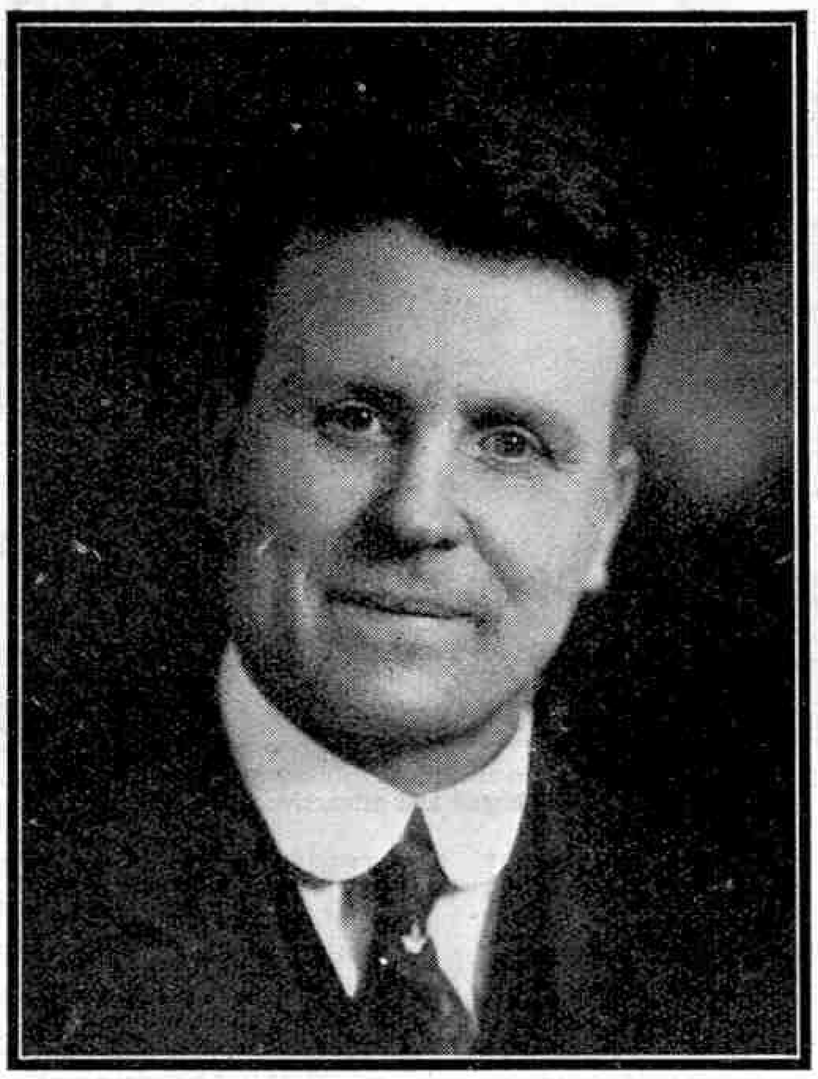
When referring last month to the wisdom of making summer plans well in advance I mentioned particularly Cricket fixtures, Cycling runs and Rambles. Another item that calls for preparation many weeks ahead is the Summer Camp, if it is intended to organise one. The choosing of the site and the working out of the many details in connection with it require a surprising amount of time if the results are to be satisfactory. It is impossible to arrange a successful camp in a last-minute rush and, generally speaking, the more time taken for the preliminaries the better. If suitable arrangements are made beforehand the holiday will be a very happy one even if the weather is not too good. The majority of boys have their summer holidays about the same time, and if the Leader is able to fit in part of his holiday, there should be little difficulty about obtaining the necessary members for the camp.

I can assure Leaders who have not hitherto organised a Summer Camp that it is well worth considering. The general impression that a camping holiday is one beset with discomfort and difficulties that can be overcome only by the hardiest is far from correct. On the contrary, such a holiday, if well planned, is peaceful enjoyment. Of course the campers must be prepared to see the humorous side when things do not go quite as they should. If a friendly or too inquisitive cow treads on the eggs, for instance, it is foolish to get annoyed!

A camping holiday, given reasonably good weather, is ideal from the point of view of health and outdoor pleasure of the best type. Another great point in its favour is that it results in those taking part getting to know one another's real characters in a way that might take years under conditions of ordinary living. The experience of those Leaders who have taken their club members to camp, even if only for a short period, has been that the club has received a very great increase in strength and vitality. The close companionship of camp has broken down any barriers that previously may have existed between various sections of the club, and has produced a new spirit of enthusiasm that has resulted in marked progress in every branch of the club's work.

Meccano Club Presidents

No. 12. Mr. J. T. Favelle



Mr. J. T. Favelle is both President and Leader of the Rosemount (Regina) M.C. This progressive Canadian club was affiliated in August 1932, and has a splendid record of activity. It owes much of its success to the enthusiasm, generosity and careful guidance of Mr. Favelle.

Cricket Fixtures Wanted

Mr. R. H. Smart, the Secretary of St. Oswald's M.C., Thornton Heath, is organising a club Cricket Team, no members of which will be older than 15 years. He would like to hear from any other Secretary who is organising a Cricket Team this season, with a view to arranging fixtures. Secretaries interested should write to Mr. Smart at 14, Kensington Avenue, Thornton Heath, Surrey.

I am very pleased to print this invitation, and shall be delighted to perform the same service for any other Meccano club.

Revised List of Demonstration Models

The list of Demonstration Models available on loan to affiliated clubs has just been revised, and I shall be very pleased to send a copy to any club Leader who desires one. Models that have been in circulation for several years have been withdrawn, and their places taken by some splendid new ones chosen for the special interest of their movements. They include a Bascule Bridge, Waterwheel, Twin Beam Engine, new Motor Chassis, Motorcycle Engine, Pit Head Gear and a large Horizontal Engine. The new Motor Chassis is fitted with a 6-volt motor and requires a 6-volt accumulator. With the exception of this model, and the Meccanograph, which was featured in the old list, all the models normally are fitted with high-voltage motors using mains current, but in certain instances 6-volt motors can be fitted if desired to allow the use of accumulators.

No club Exhibition is complete without a Demonstration Model from Headquarters, and I hope that when planning Exhibitions Leaders will avail themselves of the privilege of borrowing any of the 15 models enumerated in this list.

Reports from Unaffiliated Clubs

The other day the secretary of a very young and unaffiliated club concluded a chatty letter to me by expressing a doubt as to whether I would be "interested in the doings of a club that is only in a small way." In replying, I assured him that his letter had given me much pleasure and that I shall look forward to hearing regularly of the activities of his club, and shall watch with interest its progress toward affiliation with the Guild.

I mention this little incident in case there are other secretaries of unaffiliated clubs who are under the impression that I am not sufficiently interested in the efforts of such clubs to warrant their sending me reports of their activities. I always follow the proceedings of these small clubs with the greatest interest, whether they are new ones striving to establish themselves firmly, or larger organisations needing only a Leader or a permanent club-room to enable them to qualify for affiliation. All interesting reports from the secretaries of unaffiliated clubs are used in the Guild pages of the "*M.M.*," and the publicity thus given often results in many new recruits for the clubs concerned.

Proposed Clubs

Attempts are being made to establish Meccano Clubs in the following places, and boys interested should communicate with the promoters whose names and addresses are given below:

BEDFORD—D. C. E. Gould, 35, Howard Avenue, Queen's Park.

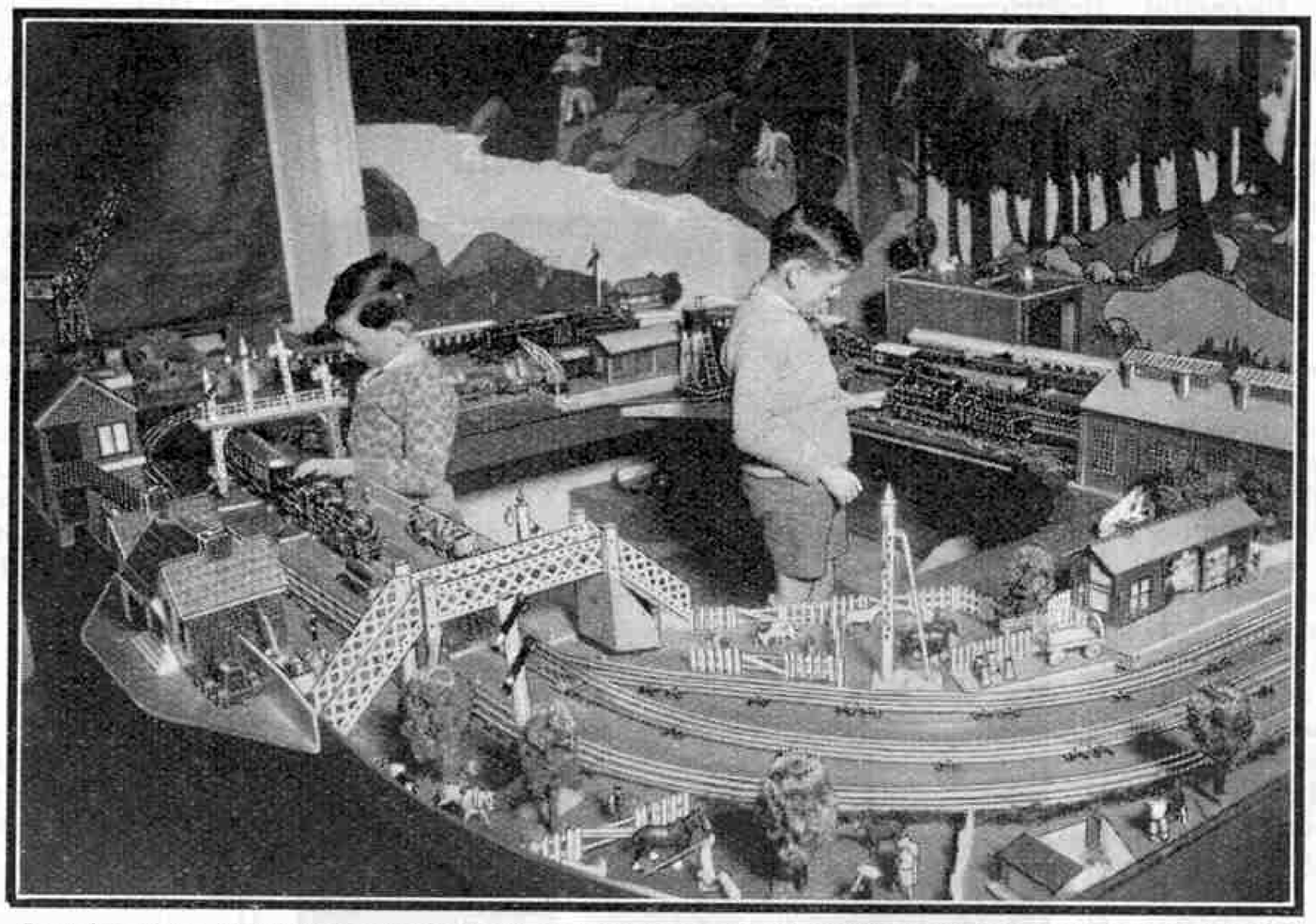
HOLLAND—H. Ijzerhuis, Postbus 52, Zaandam.

Running Your Own Electric Railway

The Fascination of Remote Control

HORNBY miniature railways afford the owners of even the simplest layout many hours of splendid fun, but their fascination is greatest when the layout is electrically-operated. Perhaps the first advantage to strike the owner of a system that has been changed over from clockwork to electric is the fact that there is no winding up of the locomotives to perform. This may seem a small thing in itself, but when several engines are in use on a clockwork line the constant winding of them can become tedious. A point of importance too is that electrically-driven trains continue to run as long as the current is switched on. Thus they are not likely to end their journeys somewhat suddenly when nowhere near a station. This can happen on a clockwork system, unless the capabilities of the engines are well-known and their management is arranged accordingly.

The greatest advantages are realised in the degree of control that it is possible to exercise over the movements of electric locomotives. A much more realistic effect is obtained when the engine can be started or stopped, speeded up, slowed down or reversed as required, by the movement of a lineside switch than when the giant hand of the model railway operator is constantly thrust across the miniature "sky." Some hand-work of course is necessary, even on the most elaborate systems, but there is far less than is required when a clockwork layout is being operated.



Good fun with a Hornby Electric Railway! Two miniature railway operators busy running the train services on a well-arranged and attractive layout.

The maximum degree of control can be exercised over the larger 20-volt Hornby Electric Locomotives that have automatic reversing mechanism. As reversing is effected by switching off the current and switching it on again, complete control is possible by means of the speed regulator handle on the T20A and T20 Transformers. The speed regulator thus governs the starting, stopping, reversing, and speed control of the locomotive. This reduces the control apparatus to a minimum and is a great advantage in securing ease of operation. To make the reversing movement as rapid and smooth as possible the "off" and "maximum" positions of the speed regulator handle are adjacent to one another.

The knack of reversing is soon acquired, although beginners are apt to be a little awkward at first with the switching off and on again of the current. A point to notice is that if an automatic reversing engine is run into a station with its train and is stopped, it will start up in the reverse direction if the current is simply switched on again by the speed regulator. This is because the automatic reversing mechanism will have been actuated by the switching off and subsequent switching on of the current. In order to avoid this reversal the current should be switched off, as though to stop the train, and then on and off again rapidly before the train comes to rest. This causes the automatic reversing mechanism to operate twice so that no alteration in direction is effected on again switching on. The train therefore starts in a realistic manner in the correct direction.

In addition to the automatic reversing mechanism, these locomotives are fitted with a cut-out lever in the cab. When this is pushed in the automatic reversing gear is thrown out of action. If it is pushed in and pulled out again to its original position, the engine is reversed. Thus the lever provides a method of reversing by hand if required.

Where automatic reversing locomotives are employed the assembly of vehicles to form a train can be carried out in a most realistic manner, for the movements of the engine to and fro are governed entirely by remote control. In conjunction with the use of the automatic couplings fitted to Hornby Rolling Stock, this enables the train to be made up without being touched by hand.

With the exception of the smallest electric engines that do not reverse and the EPM16 Special Tank Locomotive, the remaining Hornby Electric Locomotives, both 20-volt and 6-volt, have to be reversed by manipulation of a lever in the cab. Speed control however is still effected without touching the engine.

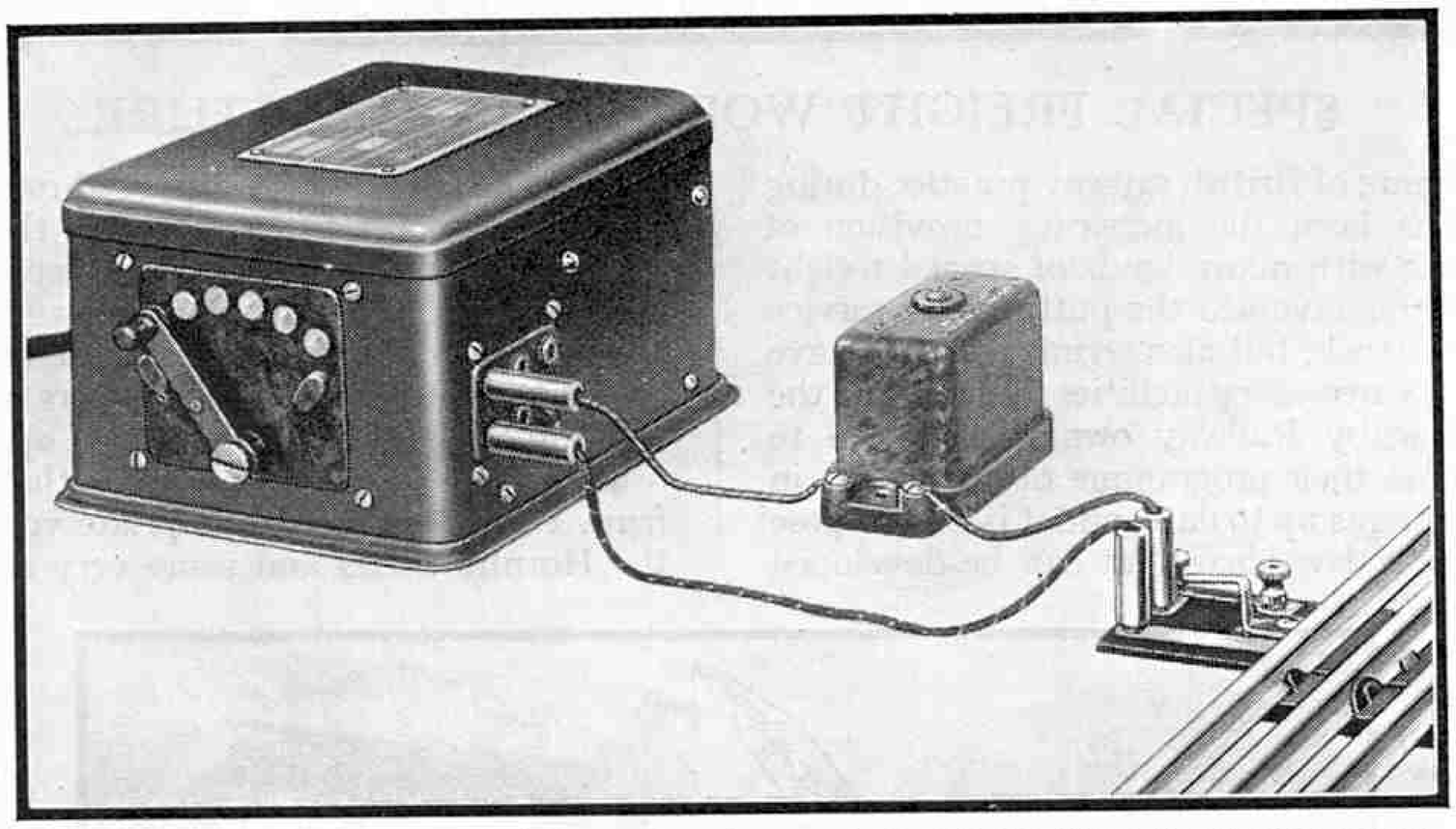
Of the 6-volt Hornby Electric Locomotives, the EPM16 Special Tank is exceptional in that it can be completely controlled from the lineside, both for speed and reversing. It requires special equipment, however, for it is reversed by reversing the direction of the current passing through the motor. The Reverse and Resistance Control Switch therefore is made for use with this Locomotive. This has separate levers for controlling the speed and the reversing movements. It must be used to control the locomotive, whether the Hornby Transformer-Rectifier or an accumulator is used as the source of power.

Circuit Breaker for Hornby Electric Trains

A New Device to Replace Fuses

By "Tommy Dodd"

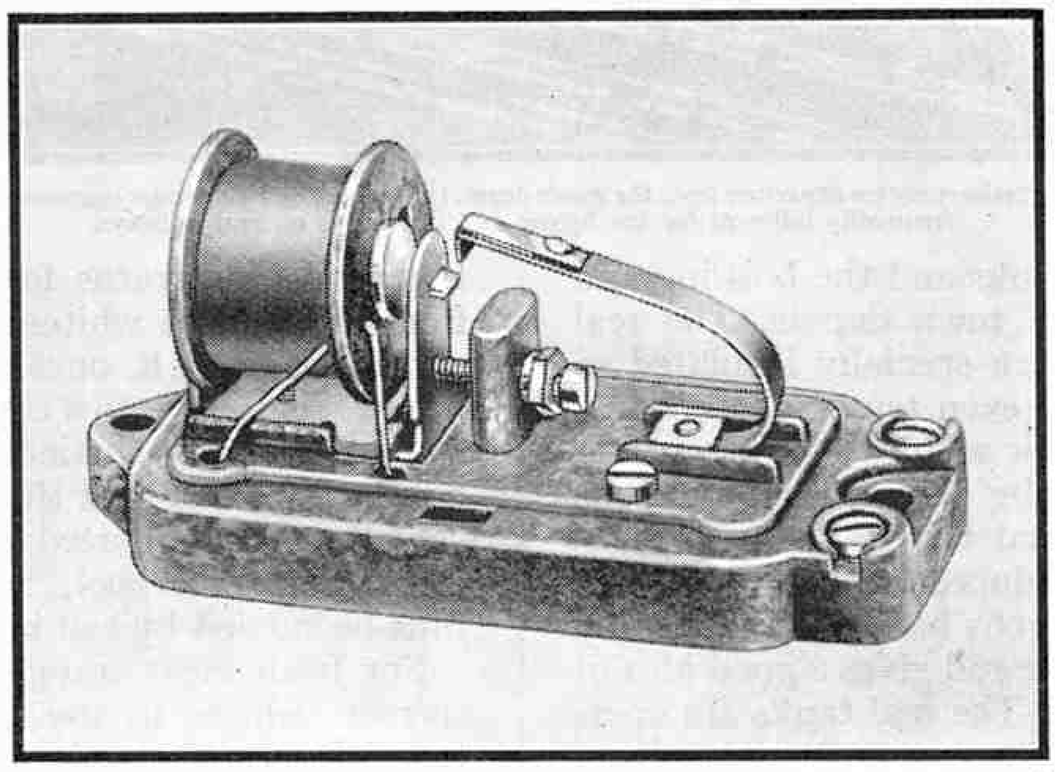
THIS month I have to refer to a subject that is of special importance to all owners of Hornby Electric Railways, and to those who are contemplating the purchase of their first Electric Train Set. On electric railways of any kind, real or miniature, it is necessary to make some provision for cutting off the current in the event of a short circuit. Ever since the introduction of electricity into the Hornby Railway System a safety fuse has always been a feature of the Terminal Connecting Plate by means of which the power supply is led to the track.



The Hornby Circuit Breaker connected between a transformer and the track. It will be noticed that it is inserted in the wire connected with the centre rail.

The fuse itself consists of a length of soft wire that is capable of carrying only a prescribed amount of current. When any mishap occurs, such as a derailment, that results in a short circuit between the centre rail and the running rails, the amount of current passing becomes excessive. This excessive current melts the fuse wire, so that the circuit between the power supply and the track is broken. The current is thus instantly cut off, preventing any damage that otherwise would be caused to the Transformer or accumulator. When the cause of the short circuit has been removed, a fresh piece of the correct fuse wire is fitted between the terminals of the Terminal Connecting Plate, and operations can then be resumed.

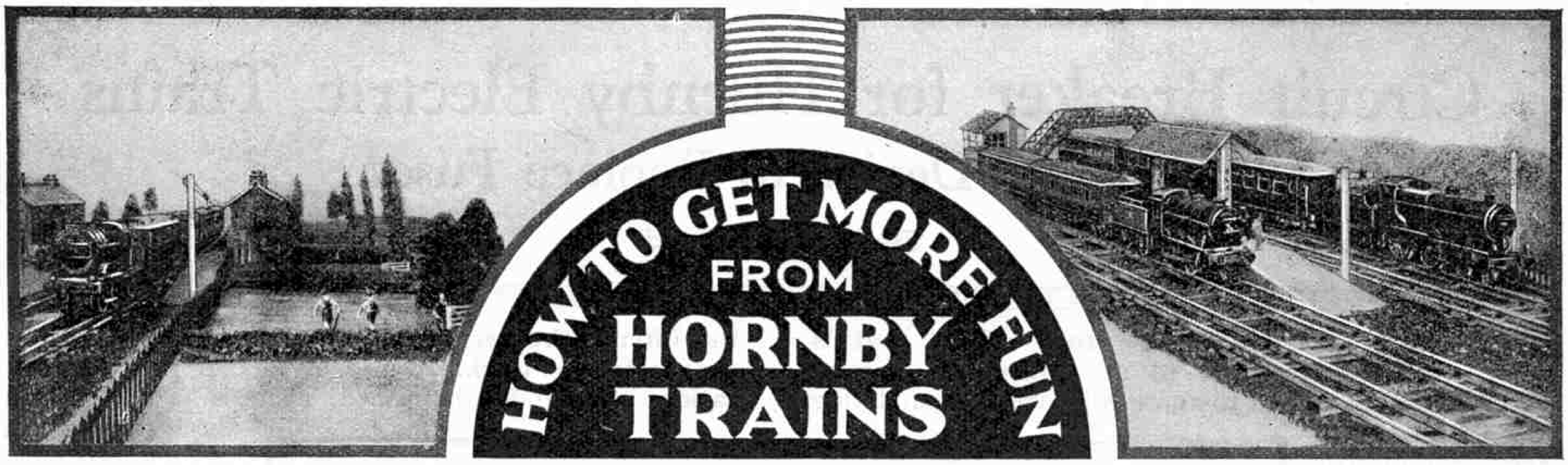
The renewal of the fuse wire is always rather a nuisance, and the situation is worse if the short circuit occurs when the supply of fuse wire has run out and the local shops are shut. All trouble of this kind is avoided by the use of the new Hornby Circuit Breaker. This device is incorporated in the circuit between the power supply and the Terminal Connecting Plate, as shown in the upper illustration on this page. In the event of a short circuit the Circuit Breaker "trips" and cuts off the current supply to the track. It also gives two positive indications of what has happened. There is a "click" from the mechanism when tripping occurs, and at the same time the red button on top of the casing of the Circuit Breaker rises.



The mechanism of the Circuit Breaker, showing the electro-magnet, hinged armature and contact spring. The latter is shown in the "tripped" position.

The mechanism inside the Circuit Breaker casing consists essentially of an electro-magnet, a hinged armature and a flat contact spring. When conditions are normal the current flowing through the electro-magnet is not sufficient to attract the armature, and the latter remains in contact with the contact spring. The button rests on this spring near to the end that is normally in contact with the armature. When the current flowing becomes excessive, as the result of a short circuit, the armature is drawn towards the electro-magnet and releases the free end of the spring. This release breaks the circuit between the power supply and the track, and the action of the spring causes the button on the top of the casing to rise. The tripping of the mechanism causes the "click" already referred to. The Hornby Circuit Breaker thus reproduces in miniature the functions of the real circuit breakers that are a necessary feature of the distribution arrangements of any electric power system.

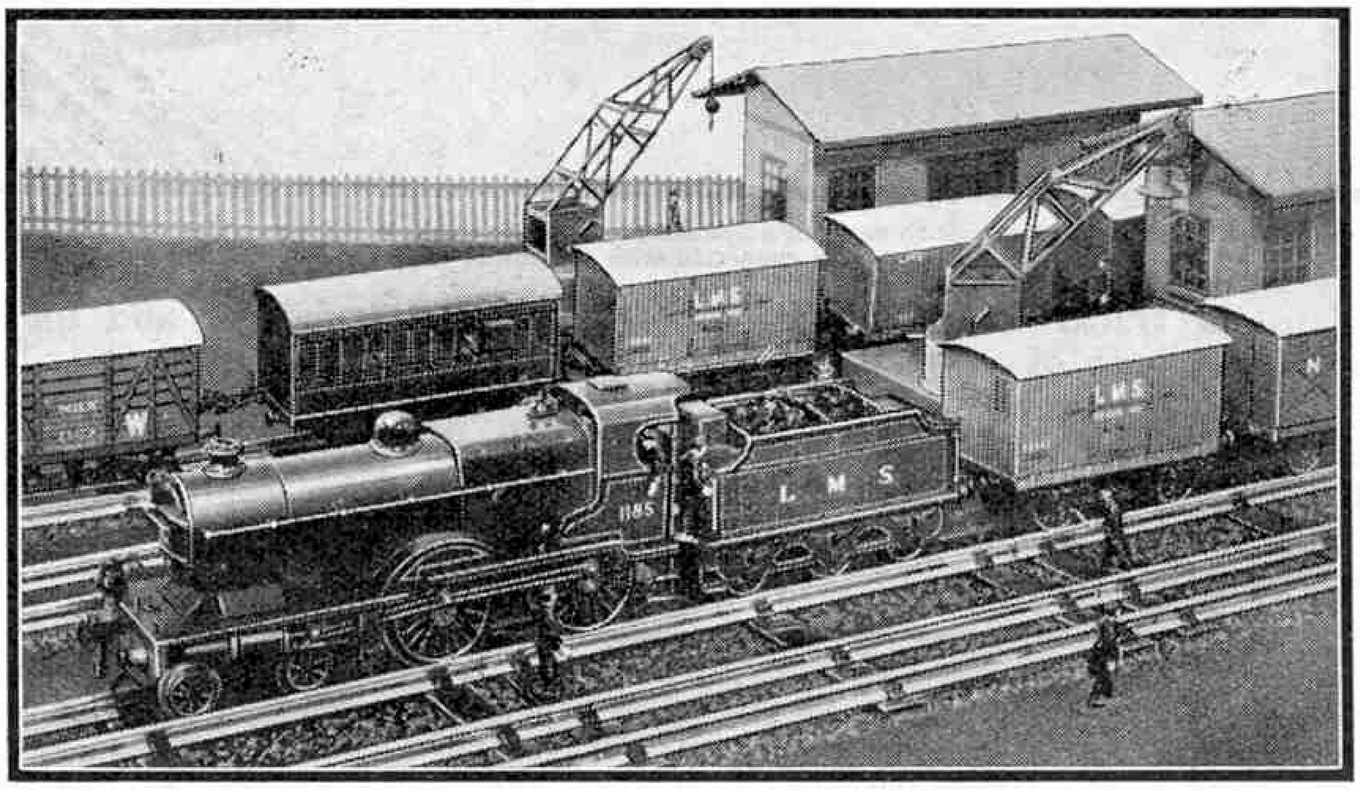
It is most important that no attempt should be made to interfere with the adjustment of the Circuit Breaker mechanism. Each Circuit Breaker is sent out correctly set to "trip" at about two amperes. If the adjustment is altered in any way, even to a slight degree, the tripping mechanism may not come into operation to prevent the Transformer from possibly serious damage in the event of a short circuit occurring.



SPECIAL FREIGHT WORKING IN MINIATURE

A STRIKING feature of British railway practice during recent years has been the increasing provision of equipment for dealing with many kinds of special freight traffic. Not only has this involved the putting into service of appropriate rolling stock, but also terminal points have to be provided with the necessary facilities for handling the particular traffic. Hornby Railway owners are keen to include such services in their programme of operations in order to keep their systems up to date, and it is the purpose of this article to give a few ideas that can be developed more fully on individual systems.

The variety of goods wagons available in the Hornby Series makes it possible to assemble and operate practically any kind of freight train. Of the various specialised modern types perhaps the most attractive is the Milk Tank Wagon. The increasing use of these vehicles in actual practice for the rail carriage of milk in bulk is a development of recent years. The milk is worked up to London from the various producing centres in these tanks and the bottling and distribution is carried out from town depots. The real tanks are glass-lined and they are specially insulated so that their contents remain at an even temperature. They are instantly recognisable by their white colouring and in this and other details the Hornby Milk Tank Wagon is a close reproduction of the actual thing.



A fast freight train ready for departure from the goods depot. It is hauled by a passenger locomotive, a practice frequently followed for the lighter and fast trains on real railways.

The lower photograph reproduced on the next page shows a train of these Tank Wagons hauled by a Hornby No. 2 Special G.W.R. Locomotive and gives a good idea of the realistic appearance of them. The real tanks are operated over all four railway groups so that all Hornby Railway owners can make correct use of the miniature vehicles on their own layouts.

In addition to milk specials there are many other fast trains of similar kinds that are run to convey farm produce and foodstuffs generally from the country districts to the towns and cities. In order to deliver their goods in time for the early morning markets the majority of such trains, except those travelling exceptionally long distances, make the best part of their journeys through the night. This is therefore a point to be noted by those Hornby Railway owners who make a practice of reproducing night conditions by operating their layouts with only the light from the Hornby electrically illuminated Accessories. The running of one or two freight flyers under such conditions will add to the fun and variety of operations.

Then there are numerous trains that carry fish, meat and fruit. For all of these appropriate vehicles are available in the Hornby Series and some very realistic trains can be assembled. The Fish Van is of special interest to L.N.E.R. miniature railway owners for it represents a type of vehicle used on that line for the specials from the fishing ports to the inland centres of population.

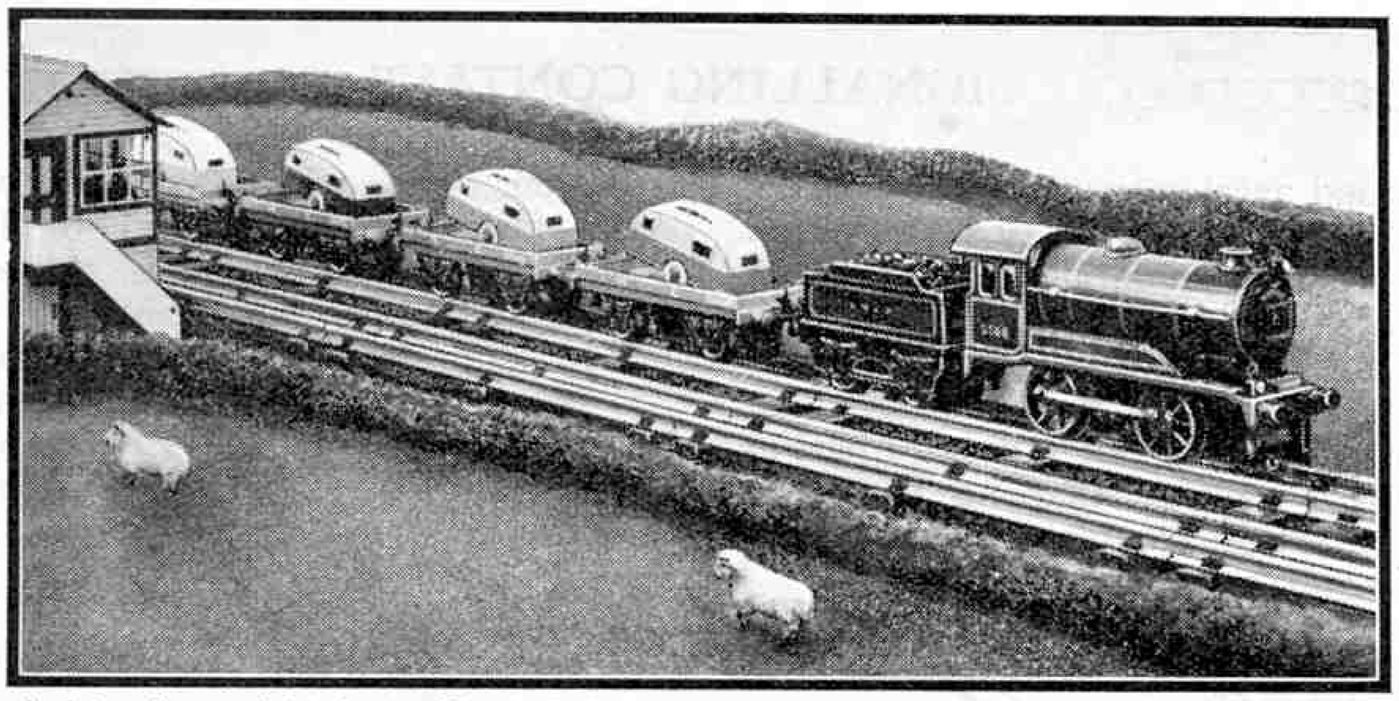
The kind of meat traffic supposed to be carried affects the types of vehicles used. The popular Hornby Refrigerator Van represents the fully-insulated meat vans of actual practice that are fitted with refrigerating apparatus for carrying frozen meat imported from abroad. The white-painted exteriors of these vehicles, except for the S.R. ones, make them quite a striking sight when assembled into a complete train. The S.R. Refrigerator Van is equally distinctive in its way for it is painted the peculiar shade of pink that is preferred by the S.R. for such vehicles. The imported meat traffic from ports such as Plymouth, Liverpool, Southampton and elsewhere can thus be carried by rail in miniature.

For fresh meat traffic the ventilated Meat Van is the correct vehicle to use. This Hornby Van is based on L.M.S.R. practice and can be used in a realistic manner for the assembly in miniature of such trains as those run from Scotland direct to Broad Street, the L.M.S.R. City terminus, whence their loads are rapidly whisked away by road to Smithfield Market.

Another interesting L.M.S.R. Van is the No. O Banana Van. It represents the specially steam-heated and brake-fitted vans of real practice that are used in such numbers for the important banana traffic dealt with at Garston and

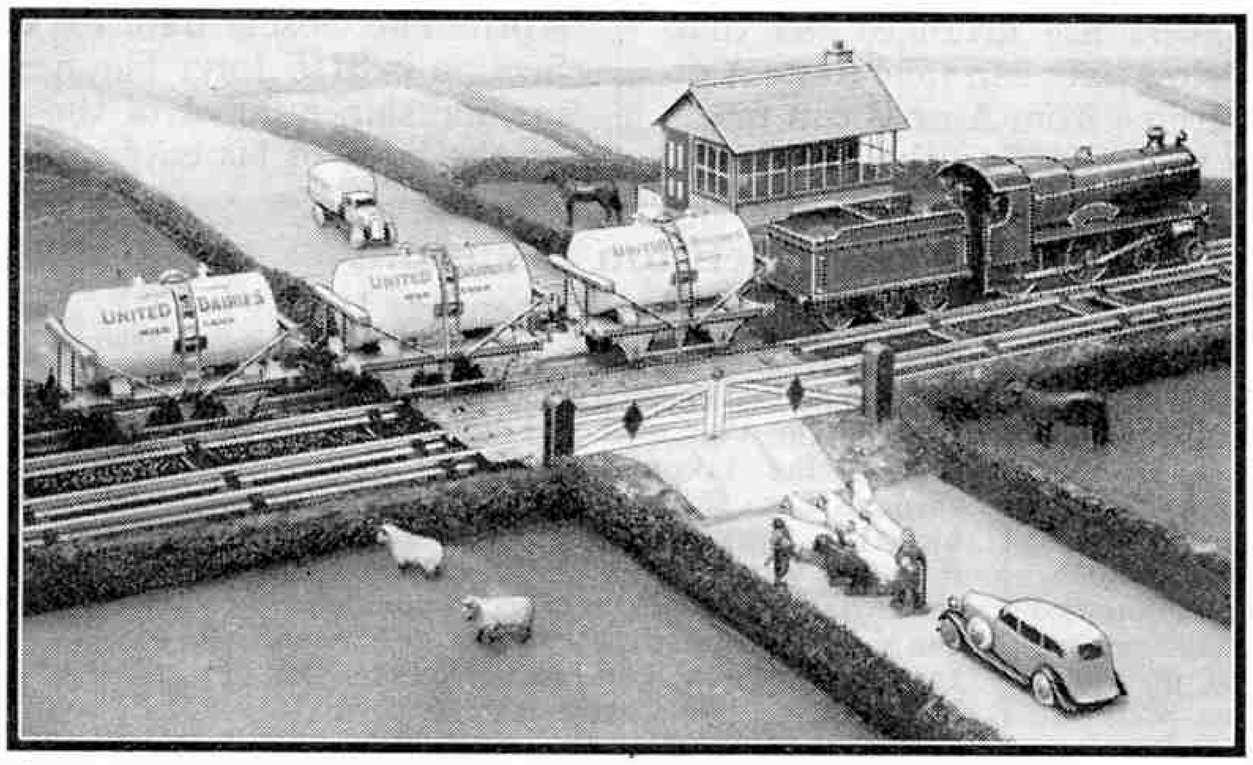
Avonmouth. The No. 1 Banana Van with its bright and attractive finish incorporating the familiar "*Fyffes*" label can be employed very well in conjunction with it, and will add to the variety of stock on a miniature banana special.

As a rule fast freight trains of this kind are hauled by engines specially designed for the work and classified generally as "mixed traffic" types. Quite frequently however express passenger locomotives are employed, if convenient. Modern types have sufficient reserve power to deal with the loads and the speed capacity of passenger engines is a decided advantage where timings are sharp. On a Hornby Railway therefore No. E120 Special or No. 1 Special Locomotives can be used as the regular engines, for they resemble fairly closely the mixed traffic types of actual practice. When necessary however or, if preferred, as a usual custom, express passenger locomotives of the E320 and E220 Special types can be employed on electrically operated layouts, or their clockwork-driven counterparts on other systems.



An interesting special train on a Hornby Railway. It is composed entirely of Flat Trucks, and is conveying a complete consignment of Caravan Trailers, Dinky Toys No. 30G.

For fast freight trains carrying general goods, which are run in large numbers nowadays, ordinary covered vans and open wagons are used to a considerable extent. The Luggage Van and Wagon of the Hornby Series can therefore be employed to good purpose for similar duties in miniature. A great favourite is the No. 2 Luggage Van, which is a bogie vehicle and therefore has a higher load capacity than the corresponding No. 1 Luggage Van, which is of the standard four-wheeled type. Very useful too is the Open Wagon "B." This is fitted with a raised longitudinal bar that can be made to support a Hornby Tarpaulin and thus protect from the "elements"—as in actual practice—any load that must be kept dry, but which does not require to be conveyed in a van. These Wagons are very popular on the G.W.R. and the S.R.



An express milk service in miniature. The Milk Tank Wagons of the Hornby Series that make up the train are very attractive and realistic vehicles.

A point that should not be overlooked is the operation of road motor services in connection with fast freight trains of the types we have been describing. The various lorries and vans included in the Series of Meccano Dinky Toys can be used very well for numerous miniature railway road services. In addition there are the Mechanical Horses and Box Van Trailers that are finished in the colours of the four group companies, as described by "Tommy Dodd" in the February "*M.M.*" Many boys operate quite extensive road services in connection with their miniature railway systems and this practice increases considerably the realism and interest of their layouts

Another use for various vehicles of the Dinky Toys Series is as loads for Hornby Wagons or Vans, as appropriate. The No. 2 Luggage Van with its wide double doors is very suitable for motor car traffic and will accommodate two Dinky Toy Cars at once. It is more spectacular however to carry such loads on the Hornby Flat Truck and most boys prefer to use this vehicle for such work. Tractors, Cars, Wagons or Vans can be loaded on the Flat Truck and look most effective. A recent addition that can also be used is the Caravan Trailer, Dinky Toy No. 30G, an interesting and up-to-date vehicle. Such loads can be conveyed singly or they can also be made to represent a bulk consignment of motor or other vehicles being taken to an exhibition or show, or being conveyed for shipment abroad.

The marshalling of the vehicles composing a fast freight train is a matter of importance. The fast services of actual practice are only possible as a result of the fitting of much of the stock employed with automatic brakes and other equipment generally corresponding to that of passenger trains. Some of the freight trains are what are known as "fully fitted." They are "piped" or have continuous brake pipes connected throughout the train and must have brake apparatus provided on at least half of the vehicles. As all of them are piped, their position in the train whether they are brake-fitted or not, does not matter. The placing of several piped vehicles in between brake-fitted ones enables the braking power to be transmitted between the latter. "Partially fitted" trains are composed of some brake-fitted vehicles and the remainder ordinary stock; to make their brake power effective of course the fitted vehicles must be marshalled next to the engine.

In miniature therefore it is necessary to determine which wagons, or vans, shall be considered brake-fitted and which shall not. In general all vans can be imagined to be so fitted for their purposes necessarily make them suitable for fast freight work and, occasionally, for conveyance in passenger trains. Special types such as the Milk Tank Wagons also will rank as brake-fitted vehicles. Open wagons are not fitted as a rule, but there are exceptions such as the type represented by the Hornby Open Wagon "B." In assembling fast freight trains in miniature therefore it is necessary to bear in mind whether they are "fully fitted," or only "partially fitted"; and to take care that the correct vehicles are used, marshalled in the proper manner according to the type of train. If this is done the working of such trains becomes far more interesting.

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

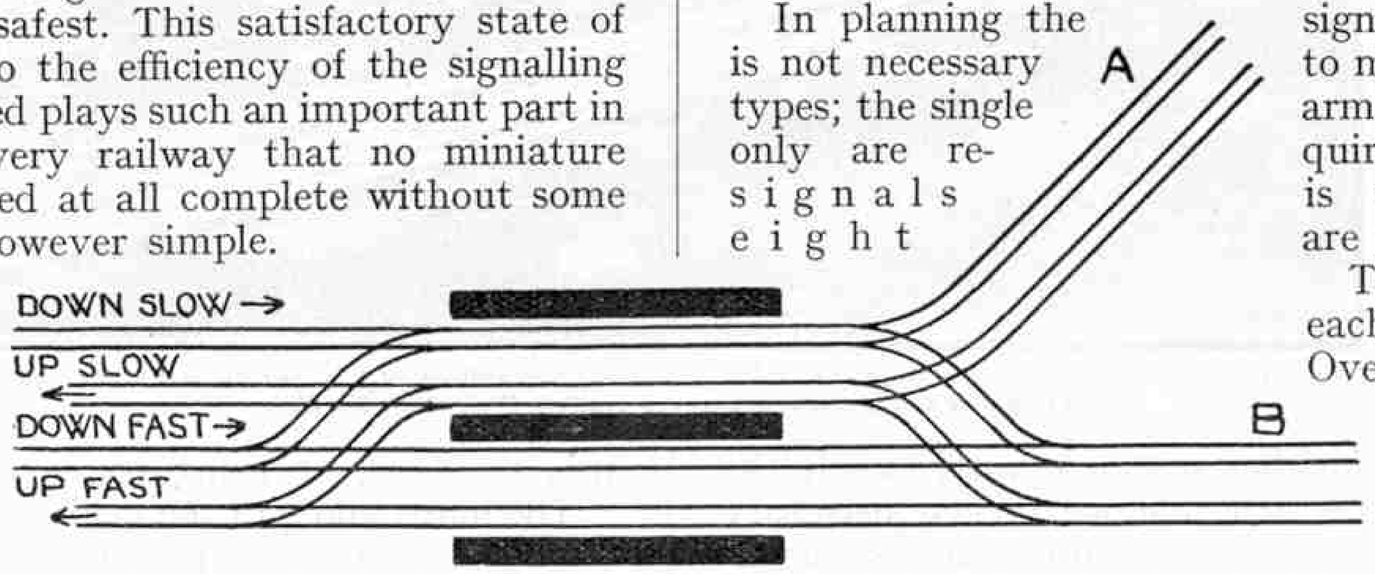
H.R.C. COMPETITION PAGE

SIGNALLING CONTEST

In spite of the all-round accelerations of recent years, the high standard of efficiency and safety of travel on British railways has been fully maintained; in fact it is often stated, and with a good deal of truth, that the fastest trains are the safest. This satisfactory state of affairs is due largely to the efficiency of the signalling system. Signalling indeed plays such an important part in the organisation of every railway that no miniature layout can be considered at all complete without some system of signalling, however simple.

It is good fun to try one's hand at devising a system of signalling to suit the requirements of an imaginary station, and this month we give our readers a chance to exercise their ingenuity in this direction. The accompanying illustration shows a junction layout without signals; and competitors are required to submit their ideas for a complete signalling scheme.

It will be seen that a four-track section, with separate lines for fast and slow traffic, leads to the station in the down direction. After the station, however, the four tracks divide into two double track routes to A and B respectively. Double crossovers are arranged, so that down trains on the fast and slow lines can take route A or B as required. Further, up trains from A or B can reach the fast or slow lines when passing on to the four-track section. The traffic consists of express trains on the fast lines to A and to B, and corresponding up trains; and stopping trains on the slow lines to A and to B, and vice versa.



The junction layout referred to on this page. Competitors are required to indicate the correct signals for the traffic that is dealt with.

In planning the signals for this layout it is not necessary to make use of any special types; the single arm and junction patterns only are required. A total of 20 signals is necessary, of which eight are distants.

To the competitors in each Section, Home and Overseas, who submit the most complete and correct signalling scheme consisting of any Meccano Product to the value of 21/–, 15/– and 10/6 respectively. In addition a number of consolation prizes will be awarded to the competitors whose entries are not quite up to prizewinning standard, but nevertheless are worthy efforts to tackle the contest.

Envelopes containing entries should be clearly marked *"H.R.C. April Signalling Contest"* in the top left-hand corner and posted to reach Headquarters, Meccano Limited, Binns Road, Liverpool 13, on or before 30th April. The closing date for competitors in the Overseas Section is 31st July. The name, full address and H.R.C. membership number of the competitor must be written on the back of his entry.

Railway Photographic Contest

Commencing with this issue, we shall announce each month until September a Railway Photographic Contest. Competitors are not restricted to any particular aspect of railway life, but may send prints of any subject so long as this has some connection with railway working. Readers should remember that a poor photograph of a really interesting character has as much chance as a good photograph of an ordinary subject. Although competitors may send as many photographs as they wish, no competitor may win more than one prize in one contest. The pick of the prizewinning entries will be filed for possible use in future issues of the *"M.M."*

The Contest will be divided as usual into two Sections, Home and Overseas, and in each will be awarded prizes of photographic material or any products manufactured by Meccano Ltd., to the value of 21/–, 15/–, and 10/6 respectively. In addition to the main prizes, a number of consolation prizes will be awarded. Envelopes containing entries must be clearly marked *"H.R.C. April Photographic Contest"* in the top left-hand corner and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, not later than 30th April. The latest date on which entries from Overseas competitors can be accepted is 31st July.

Competition Solutions

Shunting Puzzle—December 1935

The solution is as follows:

Run the Locomotive via D and branch B pushing the Van to A and leave it there. Return the Locomotive via B and D through E to F and shunt the Wagon on branch C towards the spur A and couple it to the Van which is already there. Pull the two vehicles back to branch C and leave the Van there and proceed with the Wagon to any point near E and leave it there. The Locomotive should then return via F to pick up the Van which was left on branch C. Run back with it via F and couple up with the Wagon at E. The locomotive then proceeds to pull the vehicles to F and then reverses to shunt the Wagon into the spur A via C. Leaving the Wagon at A the Locomotive and Van run via C, F, E, D, and B and draws the Wagon on to branch line B. After this has been carried out it is a simple matter to shunt the Van on to branch line C via D, E, and F. The Locomotive is then free to return to its original position E.

Owing to space restriction it is not possible to publish the solution to the *"Hidden Locomotives Contest"* announced last December, but readers specially requiring this should apply to Headquarters when it will be forwarded to them.

COMPETITION RESULTS

HOME

February "Concealed Stations Contest."—First: G. H. Hill (36093), Chorlton-cum-Hardy, Manchester. Second: H. Napper (47015), Blagdon Hill, Taunton, Som. Third: D. T. White (42549), Oakfields, Knebworth, Herts. Fourth: K. W. Jones (39968), Weedon, Northampton. Consolation Prizes: V. Cocks (42500), Rayleigh, Essex; J. M. I. Scott (29060), Kettering; L. Dudding (19120), Aldershot, Hants.; B. H. J. Harnden (33533), Upper Tooting Park, London, S.W.17.; R. Barbary (5580), St. Ewe, Mevagissey, Cornwall; K. Linsey (36783), Cambridge.

February "Railway Photo Contest."—First: H. S. G. Darke (4461), Hampstead Gardens Suburb, London, N.W.11. Second: C. Spencer (44179), Sheffield 11. Third: D. Fear (18477), Taunton, Som. Fourth: E. W. Oglethorpe (46851), Harrow, Middx. Consolation Prizes: E. C. Morgan (10735), Wandsworth Common, London, S.W.18; H. Sutton (32476), Leeds 6; J. R. Webb (25008), Maryport, Cumb.; L. E. Smith (9903), Pendleton, Salford 6.

February "Questions Contest No. 7."—First: W. Cross (34990), Northampton. Second: L. T. A. Bern (347), North End, Portsmouth. Third: C. S. Tricker (899), Mitcham, Surrey. Fourth: R. F. Embley (41047), St. Annes-on-Sea. Consolation Prizes: D. V. C. Bentley (24591), Loughborough, Leics.; L. Reason (32408), Bushey, Herts.; A. B. Stone (88), Nuneaton, War.; K. Greaves (39332), Oldham, Lancs.; W. Fleming (31024), Linthorpe, Middlesbrough.

OVERSEAS

December "Shunting Puzzle."—The entries submitted by the following competitors were the first correct ones to be opened and therefore, they have been awarded cash prizes of 5/– each. Warren A. René Toureau, Mauritius; G. S. Martin, Christchurch, C.I., New Zealand; and J. Hockey, Calgary, Alberta, Canada.

Branch News

ADDISCOMBE.—A lecture by one of the members on the railway system of the Isle of Man was greatly enjoyed. With the completion of the Branch track, several satisfactory running meetings have been held. The outlook is very favourable and further enthusiastic members have been recruited. A special feature of the programme recently has been the celebration of the second anniversary of the foundation of the Branch. Secretary: G. Chandler, 62, Ashburton Avenue, Addiscombe, Croydon.

FOREST SCHOOL (LONDON).—Regular meetings are held, but members may attend the Branch room each night. On various occasions timetable working of an experimental character has been carried out. Difficulties have arisen owing to the track being situated on the floor, but it is hoped to overcome this shortly by the provision of a raised baseboard. Sufficient locomotives and rolling stock are available for the working arrangements at present in force, and the track meetings held so far have been greatly enjoyed. Secretary: H. J. Pye, Forest School, Nr. Snaresbrook, London, E.17.

HOLYWELL (OXFORD).—The inclusion of an electrically-operated branch line has added greatly to the interest of recent track meetings. Although satisfactory services have been operated, the track itself is to have the attention of the Permanent Way Department of the Branch. Lantern Lectures have been given by the Secretary on the recently closed Brill branch line of the London Passenger Transport Board and on the Fairford branch of the G.W.R. The latest issue of the Branch magazine sold out rapidly. Although an increase in membership recently has to be reported the Branch is still open to receive further recruits. Secretary: J. Spicer, 28, Holywell, Oxford.

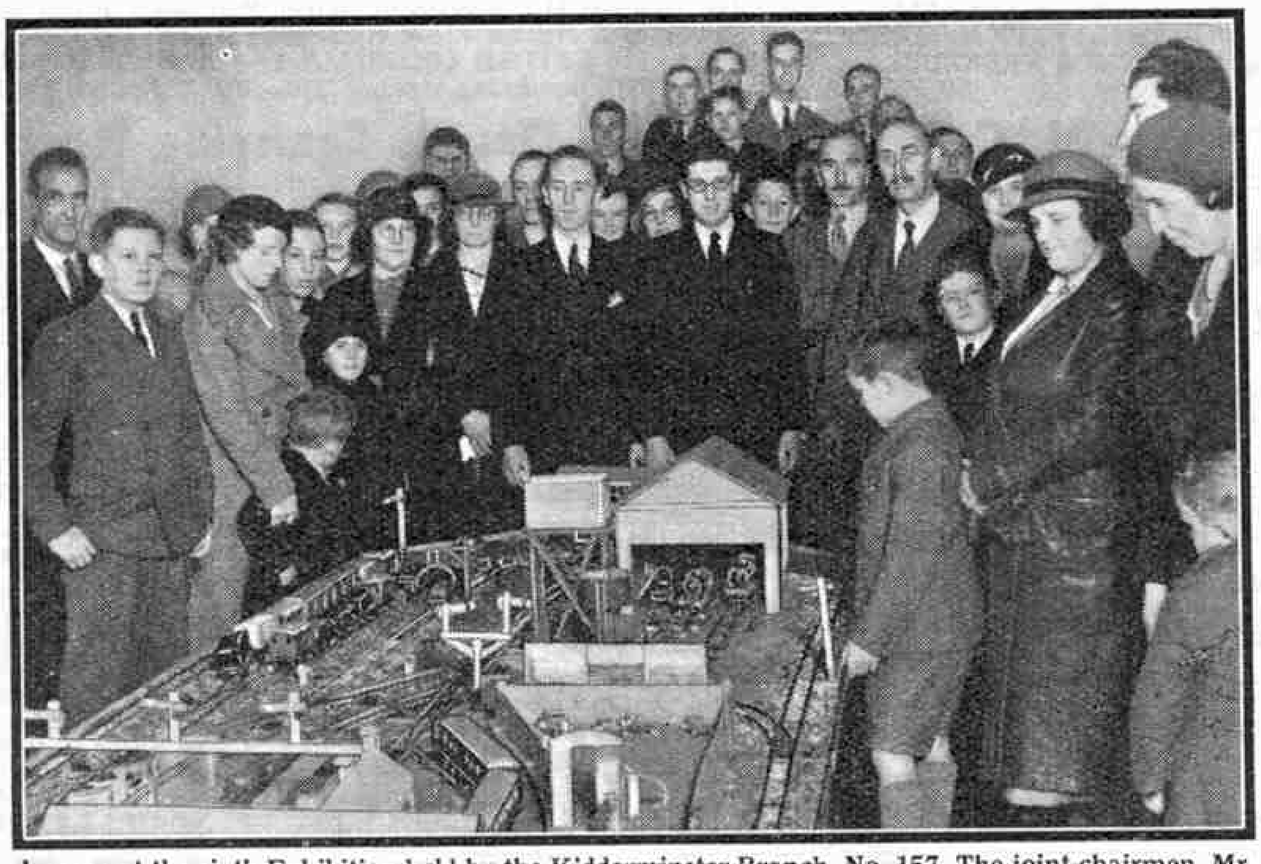
NEW SOUTHGATE.—A Lantern Lecture on *"London's Underground,"* using slides and information loaned by the London Passenger Transport Board, is considered to be the best that has been enjoyed so far. Shunting and signalling competitions have been the feature of meetings, but the most important event recently has been the Exhibition arranged by the Branch. In addition to the operation of the Branch track and a display of Hornby railway material and Meccano Exhibition Models, a free cinematograph show was a popular feature. The Exhibition was well reported locally and was a success financially. Various schemes for future Exhibitions have been discussed in the light of experience gained. Secretary: A. R. Wardle, 25, Limes Avenue, Southgate, London, N.11.

NORTHAMPTON.—Games nights continue to be popular and shunting competitions have been successfully introduced. A Talk on the *"Severn Tunnel"* and a Debate on the favourite subject *"Steam v. Electric Locomotives"* have been among events recently held. The Branch track has now been laid on a raised foundation and its opening was marked by special celebrations. Timetables have been worked out in a practical manner under the supervision of Mr. A. G. Buckingham, of the L.M.S.R., and the arrangements generally have been attended with success. The attendance continues to be very satisfactory. This is explained not only by the keenness of the members, but by the attractive programmes that are arranged. Secretary: D. K. Adams, 8, Cedar Road, Northampton.

ISLINGTON.—Subjects of recent Talks have included *"The Lure of the Footplate"* and timetable arrangements for the Branch track. A visit was paid to the Exhibition of the New Southgate H.R.C. Branch, which was greatly enjoyed. Definite duties have been allotted to the various members and the timetable arrangements discussed previously have been put into practice. It is felt that owing to the increasing membership it will be necessary to divide the Branch into two sections, Junior and Senior, and to provide additional track. Secretary: E. Muxlow, 7, Regent Park Road, Islington, London, N.W.1.

FIRST SHEFFIELD.—Special attention has been given recently to the Branch layout, and scenery is being prepared that will add considerably to its realistic effect. Special measures are necessary to deal with the heavy freight traffic on the line, and a branch line has been opened that is worked by an engine and coach on the "push and pull" system. Numerous new vehicles are under consideration both for passenger and goods traffic, and various experiments have been made with the locomotives belonging to the Branch. Secretary: W. B. Hutchinson, 35, Linden Avenue, Sheffield, 8.

FOLKESTONE.—Branch operations have commenced with members gaining experience at timetable working. Definite duties have been allotted to different members, whose efficiency is improving with practice. Meccano cranes have been constructed for loading operations and stations and tunnels are to be made. Secretary: G. Milton, 2, Rosemery Villas, Folkestone.



A scene at the sixth Exhibition held by the Kidderminster Branch, No. 157. The joint chairmen, Mr. Harris and Mr. Barker, are standing at the end of the layout. The Branch was incorporated in 1931 and the Exhibitions and Open Nights that are a regular feature of its programme are always well supported.

Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation, and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given below:

BECCLES—E. J. Hemmant, Village Farm, Gillingham, Beccles.

BOLTON—L. Monk, 30, Barcroft Road, off Bennets Lane.

LIVERPOOL—R. E. Jones, 3, Chalfont Road, Liverpool 18.

SOUTHAMPTON—C. Line, 4, Chichester Road, Bitterne.

WALLASEY—J. Brough, 10, Osborne Road, Wallasey.

Branches Recently Incorporated

302. FOLKESTONE—G. Milton, 2, Rosemery Villas, Saffrons Place, Folkestone.

303. SUTTON COLDFIELD—G. C. Low, 272, Boldmere Road, Erdington, Birmingham.

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Lithuania Air Mail Triangular stamp, **New Issue** Mozambique Air Mail, Siam Air Mail, also 15 Ships and Aeroplanes. No rubbish in this gift.
Free to **genuine** approval applicants enclosing **2d.** for postage and packing.

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42, Vanbrugh Hill, Blackheath, S.E.3.

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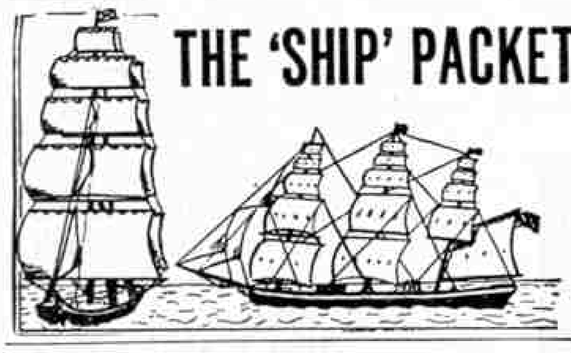

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100 PERSIA—all different 2/9
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ROYAL HOSPITAL, RICHMOND, SURREY, appeals to the readers of the Meccano Magazine to collect used postage stamps (British and Foreign) towards the new Extension Fund. These stamps should be sent to the Secretary-Superintendent.

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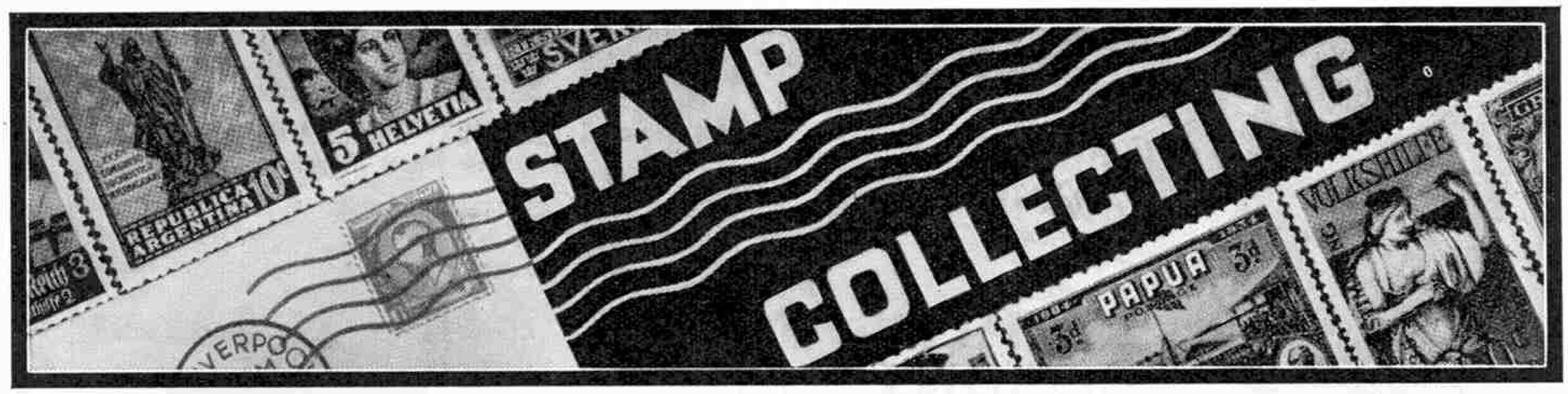

SPORTS STAMPS

APRIL is probably the greatest month of the year for the devotee of field and track sports. It sees the wind-up of football and the opening of cricket, our two great national games, and each of its weeks brings some sporting event. It seems appropriate therefore to devote this month's article to stamps that deal with sports.

Almost every one of the popular sports has been featured on stamps at one time or another, largely to commemorate an Olympic Games series or to celebrate some great sporting achievement, as in Italy's issue of May, 1934, to commemorate the International Football Championship games held that year in Italy. This issue comprised five very striking designs, one of which is illustrated here; and in addition there were four air stamps. Similar sets were issued for use in Italian Post Offices abroad. Since Italy won this championship, beating Czecho-Slovakia in the final by two goals to one, the stamp issue has come to be regarded also as celebrating the Italian victory.

Football, as befits its place in public estimation, is the most commonly featured sport on stamps. In addition to the Italian series mentioned, the game was featured on the 2c. value of the Bulgarian issue of September, 1931, commemorating the Balkan Olympic Games at Sofia; the 2c. stamp of Colombia's series of January, 1935, in honour of the Third National Olympiad at Barranquila; the 3c. value of Holland's issue of March, 1928, celebrating the 9th Olympic Games at Amsterdam, and on the 2,000 Kr. value of Hungary's sports charity issue of 1925.

The first series of sports stamps ever issued came from Greece in 1906 to celebrate the Olympic Games held at Athens in that year. In many ways it is the most interesting issue also, for it confines itself to designs representative of the ancient Olympic contests, discus throwing, shown on the 1c. value, wrestling (30c.), and marathon running (1 dr.). There were nine designs in all, the others being of a symbolic or allegorical nature.

Discus throwing is the most commonly featured of the field events. It appears also on the 5c. value of the Belgian series commemorating the 11th Olympic Games at Brussels in 1920; the 4c. value of Colombia's 1935 Olympiad issue; each of the five stamps in Salvador's Central American Olympiad issue of 1935; and on the 5c. value of the U.S.A. series commemorating the 10th Olympic Games series at Los Angeles in 1932.

This U.S. series contained only two stamps, the other being a 3c. value, showing a sprinter on his mark; but a special 2c. stamp was issued in connection with the winter sports section of the 1932 Games, held at Lake Placid, N.Y., in February 1932. The ski-jumping design on this stamp is a splendid sports picture that merits inclusion in every collection of stamps illustrating sports.

Winter sports, unfortunately, are poorly represented among sporting designs. Indeed, apart from the U.S. stamp and the splendid new German and Austrian, to which reference is made in the Stamp Gossip page this month, we can call to mind only two designs, a ski-runner on the 200 Kr. of the Hungary's 1925 issue, and a skating scene on the 300 Kr. value of the same issue. The latter stamp is illustrated here.

Aquatic sports too are only meagrely represented, the best design being the diving picture on the 400 Kr. stamp of Hungary's 1925 issue, illustrated here. The 5c. of Bulgaria's 1931 issue also showed a diving picture, while a girl swimmer is shown on the 24c. of Colombia's 1935 issue. Sculling is best represented by the 1½c. of Holland's 1928 series.

Track events are comparatively well represented. In addition to the U.S. sprinter and the Greek marathon runners already mentioned, there are runners of different types shown on the 15c. stamp of the Belgian Olympic issue, Colombia's 7c. of 1935, showing a desperate finish right on the tape, and Holland's 10c. of 1928. Each of the five values of Cuba's 1935 Olympic Games series shows an exceptionally fine action picture of a hurdler. The 10c. of Colombia's 1935 series and the 2,500 Kr. of Hungary's 1925 issue also show hurdlers in action.

There is not space here to list all the sports stamps available, of course, but it is interesting briefly to survey the remaining designs. Among them almost every popular sport is shown, and many of the lesser known.

Thus we have chariot racing on the 15c. of Belgium's 1920 issue, gymnastics on the vaulting horse, fencing, and cycling on the 1c., 4c., and 10c. values respectively of Bulgaria's 1931 issue. Fencing is featured on the 2c. of Holland's 1925 issue and on the 500 Kr. of the Austrian sports issue also. Other items from Holland's series, additional to those already mentioned, are yachting (5c.), putting the weight (17½c.), horsemanship (15c.), and boxing (30c.).

The Phillippine Islands issue, commemorating the holding of the 10th Far Eastern Championship Games series at Manila in April, 1934, is particularly interesting for its three designs are representative of essentially modern games. They are baseball (2c.), lawn tennis (6c.) and basketball (16c.). The lawn tennis design is rather disappointing, but the other two are really fine action pictures.

The British Empire is disappointingly represented in our sports collection with only one stamp, the 2d., showing a hurley player, issued by the Irish Free State in July, 1934, to honour the Golden Jubilee of the Gaelic Athletic Association.

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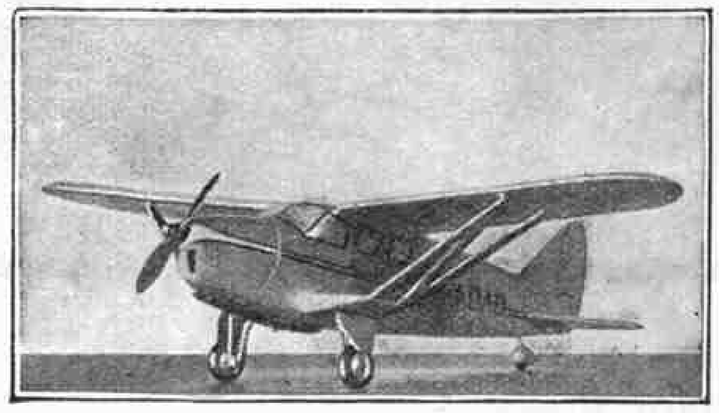

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200,000 STAMPS, what a pity we have no time to sort them through! We have purchased a huge accumulation, formed, for goodness knows what purpose, by an elderly collector. The collection dates back to the early days of stamp collecting. Even in the very brief glance we have allowed ourselves, we have noticed many high catalogue, some rarely seen now-a-days. This is at a glance; we have no time at all to gauge the perforation, colour and other varieties which must abound.

There is nothing to equal the pleasure of sorting a large accumulation such as this, so, as we are denied the pleasure ourselves, we are making it over to our customers. We have weighed the mixture into bags and offer it just as it stands at **6d.** (there's a chance for you, boys and girls), **2/9, 5/3, 10/3** and **25/-** a bag, postage extra. There is both the chance of some pleasant finds (we ourselves have seen three stamps catalogued over £4, while turning the mixture over, also some penny blacks and early Colonial Imperfs.) and the certainty of some real Philatelic enjoyment.

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LIQUIFACTORS
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Stamp Gossip

and Notes on New Issues

600 Acres on a Stamp!

The outstanding stamp in the new pictorial set that has been in course of gradual introduction by Ceylon is the 6c., illustrated here, showing an aerial view of Colombo Harbour, one of the largest artificial harbours in the world. The vast expanse of the port with its 600 acres of water is magnificently portrayed. It was intended that the 1 rupee stamp of this series should provide a companion picture with a view of Trincomates Harbour, but for "reasons of Imperial strategy" the idea was dropped.

Also we illustrate the 9c. value which shows a very charming view on a tea plantation. The production of tea is Ceylon's principal industry, the value of the exports totalling over eight million pounds sterling each year.

A Doughty General

Those of our readers, and they must be many, who have revelled in the works of the great French novelist Alexandre Dumas and his son, will be specially interested in the 10c. stamp from Haiti's new issue. This bears portraits of Alexandre Dumas, his father and his son. Dumas Père and Dumas Fils require no introduction, but Dumas Grandpère is of new interest, for his prowess with the sword was only less mighty than his descendants' power with their pens.

Thomas Alexandre Dumas was a mulatto, son of a French nobleman, a planter in the island of San Domingo. Early in life he quarrelled with his father and came to France, where he enlisted in the army. He rose rapidly from the ranks, and in 1793, at the age of 21, he was general in command of the Western Pyrenean army and popularly known as the "Black Devil."

Several good stories of his amazing strength are told. On one occasion his troops were attacking an Austrian palisade. They found some difficulty in scaling the obstacle, whereupon the impatient general dashed up, seized his men one by one by the seats of their breeches, and threw them over the palisade! The enemy fled in the face of this literal rain of foes!

General Dumas died in 1806 when his son, Alexandre, was only three years old.

Winter Sports Stamps

Readers who have been interested by our article on Sports Stamps this month will be specially attracted by the recent issues of Winter Sports stamps from Germany and Austria. A most interesting feature of the Austrian series is that the designs are taken from actual photographs, made by the famous Austrian sports photographer Lother Rübelt. The two specimens reproduced on this page show the happy results that have attended this idea.

The stamps were issued in connection with the competitions of the International Ski-ing Federation at Innsbruck on 21st and 22nd February last. There were four values, the 12, 24, and 35 gr., each showing a different view of the competition course, while the high value, 60 gr., shows a view of the Maria-Theresien Strasse at Innsbruck, with the Nord Kette, a famous mountain chain, in the background.

The German series, specimens from which we hope to reproduce next month, were issued to commemorate the 4th series of Olympic Winter Games held at Garmisch in connection with the 10th series of Olympic Games that will be staged at Berlin this summer. There were three designs as follows: 6 pf. skating; 12 pf. ski-jumping; 25 pf. bob-sleighing.

* * * *

St. Lucia has a rather interesting claim to stamp fame in that it is one of the few British Colonies that retained the same stamp design throughout the reign of the late King George V. The designs introduced at the time of King George's accession have remained in use, and only the Silver Jubilee issue of last year has intervened in that period.

Now a new pictorial issue has been introduced with designs as follows: ½d., 2d. and 4d., Port Castries; 1d., 2½d. and 6d., Columbus Square, Castries; 1½d. and 3d., Ventine Falls, Soufrière; 1/–, Fort Rodney, Pigeon Island; 2/6, Monument to the Inniskilling Regiment at Morné Fortune; 5/–, Government House, Morné Fortune; 10/–, the crest of the Colony.

Motoring Pioneers on Stamps

The opening of the International Motor Show at Berlin on 15th February last coincided with the celebration of the 50th anniversary of the introduction of the motor car. To mark the occasion Germany issued two commemorative stamps, 6rpf. and 12rpf. values, bearing portraits of two great motoring pioneers, Gottlieb Daimler and Carl Benz, respectively.

New Argentine Issue

Argentine has recently issued a complete new series with a range of designs typical of the country's many industrial and agricultural activities. The outstanding designs are the 15c. and the 1p., both of which are illustrated here.

The 15c. shows the head of the famous bull "Faithful 20," property of a British rancher, for which the record price of 152,000 pesos (£8,400) was paid at the Buenos Aires cattle show in 1925. If his portrait may be used as a guide, "Faithful 20" is worth his price.

The 1p. stamp is remarkable for its insistence upon the Argentine title to the Falkland Islands. For very many years a quiet dispute concerning the rightful ownership of these islands has been dragging its weary way between the Argentine and British Governments, and it will be remembered that the Argentine refused to recognise the stamps issued by the Falklands in 1933 to celebrate the centenary of British administration, Letters bearing these stamps were surcharged on arrival in the Argentine. This gesture of defiance of British ownership, which derives from Spain's cession of the islands to Britain in 1769, threatens to bring the dispute to a head.

The remaining designs are as follows: 25c., ploughman; 30c., Patagonian ram; 40c., sugar-cane and factory; 50c., petroleum well; 2p., fruit products; 5p., Iguazu Falls. These cataracts are the largest falls in the world. More than 70 different cascades pour over them and the spray rises to a height of over 600 ft. The 10p. stamp shows a bunch of grapes, and the 20p. a cotton plant.

King Edward VIII Stamps

The preliminary steps towards the introduction of new coins and stamps bearing a representation of our new King are well advanced, and on 21st February a plaster cast of the King's head, prepared by the Royal Mint, was taken to Buckingham Palace for the King's inspection. Subject to His Majesty's approval the cast will be used in designing all the dies necessary in manufacturing King Edward VIII stamps.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations on this page have been made.

Competition Corner

IF I WERE NOT MYSELF, WHOM WOULD I LIKE TO BE?

Every boy, no matter how contented he may be with his own lot, indulges at times in the really pleasant occupation of building "castles in the air." He dreams of the day when he may become a prominent figure in the business or profession of his choice, and inevitably his mind focusses itself upon some great man who has worked his way to the top and stands prominent among his fellows. With this idea in mind it occurred to us recently that it would be extremely interesting to know who are the men whom the vast army of "*M.M.*" readers regard as heroes in their own particular sphere of activity.

The only way of ascertaining this was to devise a voting contest, and for this purpose we give in the centre of this page a list of 10 famous men who may be regarded as outstanding and representative figures in their own walk of life. The object of the competition is to decide which of these men you would prefer to be if you were not yourself. We look forward to the result with interest, for it is certain that the combined voting will reveal many interesting facts bearing upon our readers' ambitions and the directions in which their future careers will run.

This charming study of a child's head gained First Prize in the Overseas section of the November Drawing Contest for V. L. M. Noguera, Buenos Aires, Argentine.

Aviation	Flt. Lt. T. Rose	Science	Lord Rutherford
Motoring	Capt. Eyston	Cricket	Don Bradman
Statesman	Anthony Eden	Rugby	Bert Gadney
Railways	H. N. Gresley	Industry	Lord Nuffield
Tennis	F. J. Perry	Music	Sir Thomas Beecham

The rules of the contest are very simple. Each competitor is required to set out on a post card each of two things:

(1) Which of the men named he would most like to be.
(2) His estimate of the order of popularity of these 10 men as it will be decided by the massed votes of all the competitors.

Competitors will understand, of course, that the person named in section No. 1 must not necessarily be placed at the head of the list in section No. 2.

No reader may submit more than one entry.

Cash prizes of 21/–, 15/–, 10/6 and 5/– respectively, will be awarded to the four competitors who give the most accurate forecasts of the final order of voting. In addition, there will be a number of consolation prizes. In the event of a tie for any of the prizes, preference will be given to the entry displaying the neatest or most novel presentation.

Entries should be addressed to "Vocation Vote, Meccano Magazine, Binns Road, Liverpool 13," and must reach this office not later than 30th April. A separate set of prizes will be reserved for entries from Overseas readers. Overseas entries must arrive not later than 31st July.

The 1936 Photo Contests

Throughout the coming spring and summer we shall offer prizes each month for the best and most interesting photographs submitted by readers. The photographs may be of any subject, and may be made with any make of camera, plate, film or paper. The only conditions will be that each photograph must bear the reader's name, age and address, and a title on its back. The exposure must have been made by the competitor, but the developing and printing may be professionally done.

Each month's competition will be divided into two groups, Home for those living in Great Britain, Ireland and the Channel Islands, and Overseas for those living outside those areas. Each group will be divided into two sections, A for those aged 16 and over, B for those under 16; and cash prizes of 21/– and 10/6, will be awarded in each section.

Entries sent this month must be addressed "April Photo Contest, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 30th April. Overseas readers should address as for the April Competition all entries that can reach us before the Overseas closing date for that Contest, 31st July.

Competition Closing Dates

HOME	
Vocation Voting Contest	30th April
April Photo Contest	30th April
OVERSEAS	
January Cover Voting Contest ...	30th April
January Drawing Contest	30th April
February Crossword Puzzle ...	30th May
February Drawing Contest... ...	30th May
Meccano Limericks	30th June
March Drawing Contest	30th June
Vocation Voting Contest	31st July
April Photo Contest	31st July

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of the competitions.

COMPETITION RESULTS

HOME

February Crossword Puzzle.—1. H. McLachlan (Edinburgh); 2. B. Hardie (Bristol); 3. A. J. Anderson (Perth); 4. G. Burgess (London, N.12). Special Prize: E. H. Dalgleish (Nottingham).

February Drawing Contest.—First Prizes: Section A, D. H. Gibbs (Dundee); Section B, O. Collingwood (Redhill). Second Prizes: Section A, I. Macbryde (Paisley); Section B, J. T. Carr (Purley). Consolation Prizes: Section A, C. Williams (Manchester); Section B, B. Kett (Upminster).

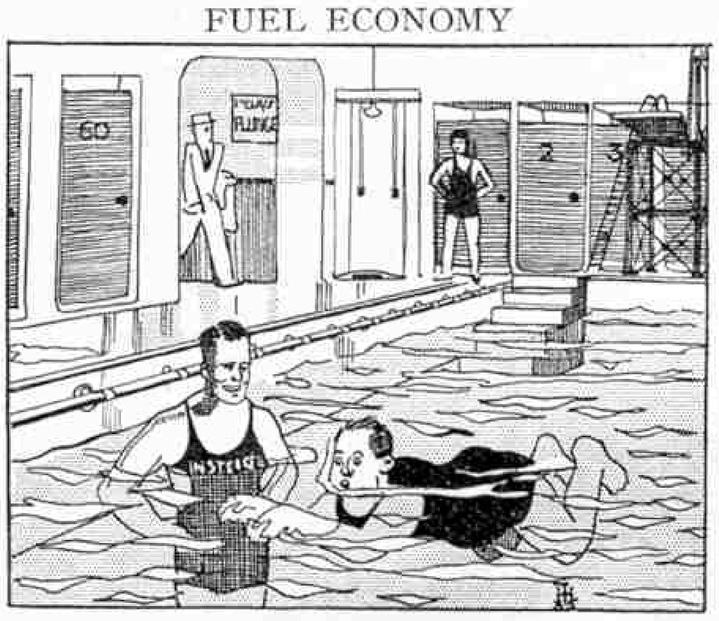
OVERSEAS

November Drawing Contest.—First Prizes: Section A, V. L. M. Noguera (Buenos Aires); Section B, D. J. Johnson (Capetown). Second Prizes: Section A, D. E. Yockney (Auckland, N.Z.); Section B, G. F. Emmerson (Greymouth, N.Z.). Special Prize: Section A, S. D. Kurlawalla (Bombay).

True Firework Story.—1. R. Simpson (Sydney); 2. T. B. Johnson (Capetown); 3. B. N. Collie (Montreal); 4. W. J. E. Evans (Toronto).

November Sketchograms.—First Prizes: Section A, C. J. Mallia (Malta); Section B, G. F. Emmerson (Greymouth, N.Z.). Second Prizes: Section A, S. D. Kurlawalla (Bombay); N. Palmer (Wellington, N.Z.).

FUEL ECONOMY



Swimming Instructor: "That's better, Sir; you ain't swallerin' so much water—doing more to the gallon, so to speak."

* * * *

American: "Why, I can get across London streets with my eyes shut."

Englishman: "I once had a friend who boasted similarly."

American: "Well, and did he get across?"

Englishman: "Yes, sir! A marble one."

* * * *

"I have a brother who got himself into trouble by opening too many offices?"

"Did he over-expand?"

"No, the night watchman caught him."

* * * *

Teacher: "Next time you are late, you must bring an excuse."

Tommy: "Who from?"

Teacher: "Your father."

Tommy: "He's no good at excuses; mother finds him out every time."

* * * *

The new servant was clearing up when the distinguished writer entered his study. "You are not burning my papers?" he exclaimed, seeing the girl by the fire.

"It's all right, sir," replied the girl. "It's only some that's covered with writing. I've left the clean paper alone."

* * * *

Blimey, I'm fed up with this new foreman. 'E came to me this morning an' sez, 'ere you down in that 'ole, jump out! So out I pops. Jump in again, he says, so in I jumps. Out again, he says, and in, an' I does. So 'ere, I says, what's all this about? You just keep on jumpin' in an' out, he says, you bring more out on your boots than you do on your shovel.

* * * *

Tom had just returned from a visit to Germany.

"Did you have much trouble with your German in Berlin?" a friend asked.

"None whatever" he replied, "but the Germans did."

* * * *

Jack: "Our cat is bigger at night than in the daytime."

Tom: "How so?"

Jack: "Because it's let out at night and taken in in the morning."

* * * *

Visitor: "And what's your name, my good man?"

Prisoner: "9742."

Visitor: "Is that your real name?"

Prisoner: "Naw, dat's just me pen name."

* * * *

"Mother says she could have soled her boots with that steak!"

"Well, why didn't she?"

"She could not get the nails through!"

* * * *

Pat: "That was a foine sintiment Casey expressed at the dinner last noight."

Mike: "What was it?"

Pat: "He said that the swatest memories in loife are the ricollections of things forgotten."

A SLOW TRAIN

Ticket Collector: "Madam, your boy can't pass at half fare, he's too large."

Boy's Mother: "He may be too large now, but he was small enough when we started."

* * * *

Small boy: "What is a pedestrian, Daddy?"

Dad: "It's a man who has a wife, a daughter, two sons and a car."

* * * *

Friend (to artist): "I hear you are giving up your studio."

Artist: "Oh no, I'm not, whoever told you that?"

Friend: "Your landlord."

* * * *

American: "There are parts of America so fertile that if you drop an acorn into your garden at night, next morning up comes an oak tree."

Englishman: "Well, there's nothing remarkable about that. There are parts of England so fertile that if you casually drop a dead cat into your garden at night, next morning up comes a sanitary inspector."

* * * *

ASKING FOR TROUBLE

"P'r'aps yer shouldn't a painted yer letters on, Len, ain't they serspicious?"

Courtesy *"L.M.S. Magazine."*

* * * *

Mother: "One helping of pudding is enough for a small boy."

Tommy: "Yet you say you want me to eat properly and you won't give me any chance to practise."

* * * *

Bob: "If Shapespeare were here to-day, he would be looked on as a remarkable man."

Bill: "Yes, he'd be more than 300 years old."

* * * *

"Willie," said the Sunday-school teacher, "you shouldn't talk like that to your playmate. Have you ever thought of heaping coals of fire on his head?"

"No, I haven't," said Willie, "but it's a great idea."

* * * *

Waiter: "Your coffee is special, sir; from South America."

Diner: "Oh, so that's where you've been, is it?"

A MATTER OF BUSINESS

Sam: "When're you going to pay me that £2 for pasturing your heifer? I've had her now for about ten weeks."

Bob: "Why, Sam, the critter ain't worth more'n £3."

Sam: "Well, s'posin' I keep her for what you owe me?"

Bob: "Not by a jugful. Tell you what I'll do. You keep her two weeks more an' you can have her."

* * * *

A visitor called at a doctor's house. "Is your father at home, dear?" she asked the doctor's small daughter.

"No, he's out giving an anæsthetic."

"That's a big word. What does it mean?"

"Three guineas," the child replied.

* * * *

Captain of cricket team (to new resident): "Will you join our cricket club, sir?"

New Resident: "Well, really, I'm afraid I know absolutely nothing about the game, I couldn't do anything except umpire."

* * * *

"Waiter! waiter! What is the meaning of this? There are two flies swimming about in my soup."

"Nonsense, sir. Why, they are both dead."

* * * *

A NEW ONE

Office Boy: "Please can I have the day off to-morrow to go to—"

Employer: "Grandmother to be buried, I suppose?"

Office Boy: "No, sir; married."

* * * *

Customer: "You're a young man to be left in charge of a chemist's shop. Have you a diploma?"

Assistant: "No, madam; but we have a preparation of our own that's just as good."

* * * *

Insurance Agent: "But you surely agree to taking out an insurance policy to cover your burial expenses?"

Wily Scot: "Na, na, mon; I micht be lost at sea."

* * * *

Mother: "I don't think the man upstairs likes Johnnie to play on his drum."

Father: "Why?"

Mother: "Well, this afternoon he gave Johnnie a knife and asked him if he knew what was inside the drum."

* * * *

"I'm not going to work at this place any more, Bill."

"Why?"

"Well, the boss passed a remark this morning that I didn't like."

"What was it?"

"He said, 'Jones, you won't be wanted here after this week.' "

* * * *

FORE AND AFT

A sailor was taking a short cut across a golf course, when a golf ball struck him on the back of the head.

"It wasn't my fault, I shouted 'Fore,' " spluttered the owner of the ball.

"Aye," replied the tar, "yer shouted 'Fore,' but the confounded thing struck me aft."

CHEAP APPROVALS

My beautiful Approval Selections are ideal for filling those vacant spaces. Pictorials, Colonials, and hard to get items. Selections from 4 a 1d. Free Gift Bi-coloured Persia all applicants.

A. V. TAPP,

108, CHESTERFIELD RD., BRISTOL

KING GEORGE V—Important Notice

THE STAMP OF TO-DAY IS THE RARITY OF TO-MORROW

Owing to the death of His Majesty King George V, all current British Colonials will shortly be obsolete. So now is your chance to obtain them before they become scarce.

I am therefore introducing EMPIRE MIXTURE guaranteed to contain only unsorted British Colonials, sent out exactly as received from Banks, Trading Stations and other Outposts of the Empire.

EMPIRE MIXTURE is the cheapest and best way to fill up the gaps in your British Colonial Collection, includes Silver Jubilees, Commemoratives, New Issues, Provisionals and heaps of other scarce stamps.

100 for **1/–**, 250 **2/–**, 500 **3/9**, 1,000 **7/3.** All post free (abroad 3d.).

As a special introductory offer I am giving to all purchasers of **3/9** or over a Queen Victoria Labuan stamp, cat. **5/–**.

Remit by Postal Order only.

K. HUMPHRIES, Dept. M., East Wittering Rd., East Wittering, Chichester, Sussex.

FINE MINT SET CRETE

Given Free to all Approval Applicants enclosing 2d. postage. For unusual Stamps at unusual prices try me. Mint Set 4 Queen Astrid, 6½d. Good Bonus Stamps given to buyers according to amount of their purchases.

If you are not on my Register—you should be.

G. W. GREEN, 44, PADIHAM ROAD, BURNLEY.

FREE STAMP WALLET

(size 3½″ × 5½″) fitted with Perforation Gauge, etc., and containing

MINT 2/6 BRITISH COLONIAL

to approval applicants enclosing 3d. (in stamps) for postage and packing.

A. B. LEWIS (Dept. C.33),
16, CRICKLEWOOD LANE, LONDON, N.W.2.

WANTED!! 500 LUCKY LADS!

To share in my Bonus Scheme. Send your orders and enrol at once.

Set Columbus Ships, 6d.; Set Columbus Triangles, 1/6; Set Mozambique Air-Post, 6d.; Fifty-Plus Packet, 1/–; 25 Air-Mail, 1/–; 50 British Colonials, 6d.; 50 Asiatics, 1/–.

Try my "New Issue Service."

Write for my "Betterway" Approvals.

F. J. LORD, 13, Princes Road, Stamford, Lincs.

200 Different Stamps Free!

Fine Variety. This splendid offer to all genuine applicants for bright, attractive, cheap approvals, enclosing 1½d. post. Don't delay, send to-day.

R. KIPPEN, 52, Cowley Rd., Leytonstone, London.

BARGAIN STAMPS

Send for my splendid value Approval Sheets. No gifts offered but the large discount allowed more than makes up for these. Enclose stamps value 2d. for postage.

P. ILLINGWORTH

Tranmere Park, GUISELEY, Leeds

FOUR FREE GIFTS!

1,000 Stamp Mounts; Perforation Gauge; Six Madrid Exhib'n Stamps; Ten Belgium Rly. Stamps. These are given free to purchasers of my Brit. Col. pkts. Queen's Head or K.G. pkts., 5/– a pkt. of 100; or K.E. pkts., 3/6 a pkt. of 50, post free. You get quality not quantity.

D. BRENCHLEY
(Dept. M.), 16, Gloucester Place, Greenwich, S.E.10.

5 Nigeria Pictorial to 3d. mint...	...	...	**11d.**
18 Nyassa Pictorial, 1921-3 mint	...	...	**1/6**
5 Chili Air. Inland to 1 Peso mint	...	...	**11d.**
5 Bijawar 1935 to 2 Annas used	...	...	**6d.**

Postage 1½d. extra. Selections from 4 a **1d.** (30 for **6d.**).

J. R. MORRIS, 9, Audley Road, Folkestone, Kent.

1,000 STAMPS FREE. To all purchasers of my **Marvel Packet** which contains **50 real value** stamps with no junk and **many** Jubilees, Commems., Airs, Pictorials, new issues and Br. Cols. Price **2/–** post free. Write **Now,** only a few packets left. No unwanted approvals sent.

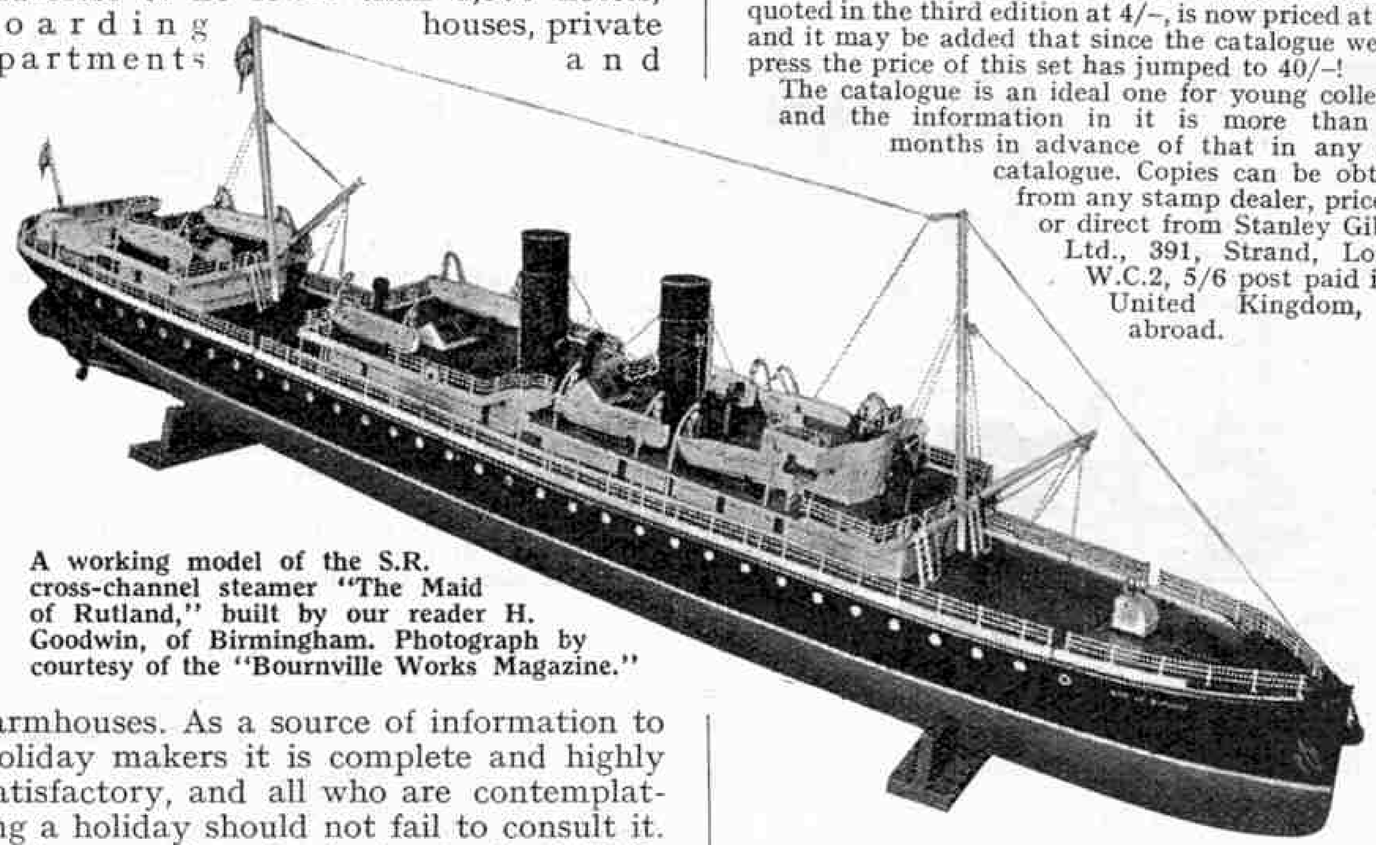
N. S. Harvey, 60, Edward Rd., West Bridgford, Notts.

"Holiday Haunts"

(Great Western Railway. 6d.)

The holiday season is here again and we are all beginning to ask ourselves where we shall go. The 1936 edition of the G.W.R. Holiday Haunts Guide has been compiled to help us to answer this question, and in its 1,024 pages it deals with hundreds of inland and seaside holiday resorts in the area served by that company. The special attractions of these resorts are well described, and hundreds of fine photogravure illustrations not only add to the knowledge on which a decision will be based, but also make the volume highly attractive.

The book is divided into seven sections, each dealing with a definite holiday region. It includes excellent maps, and gives the addresses of no fewer than 8,300 hotels, boarding houses, private apartments and farmhouses. As a source of information to holiday makers it is complete and highly satisfactory, and all who are contemplating a holiday should not fail to consult it. Copies can be obtained at all G.W.R. station bookstalls and enquiry offices.



A working model of the S.R. cross-channel steamer "The Maid of Rutland," built by our reader H. Goodwin, of Birmingham. Photograph by courtesy of the "Bournville Works Magazine."

"Walking at Week-ends"

By S. P. B. Mais. (Southern Railway. Price 6d.)

The Southern Railway not only afford facilities for ramblers who wish to reach the interesting country in the wide area they cover, but also help them to make the most of their opportunities by publishing booklets describing suitable walks. This volume is the second written for this purpose by Mr. Mais and published by the S.R. The 14 rambles described in it cover districts in Kent, Sussex and Hampshire.

The book contains 128 pages. Each walk is clearly shown by means of a special map, and in addition there are many photographs of the country covered. The book is of a convenient size to fit the pocket, and has waterproof covers. It can be obtained at S.R. station bookstalls and enquiry offices.

The 1936 Model Railway Club Exhibition

The 1936 Exhibition of the Model Railway Club, to be held at the Central Hall, Westminster, during Easter week, will include a display of members' work, with working steam locomotives of all gauges up to 1½ in. scale. Free rides behind the larger locomotives will be given to visitors. Other exhibits will be a working Gauge O electric railway and a free cinematograph show.

The Exhibition will be opened at 2 p.m. on Tuesday, 14th April, and will continue until Saturday, 18th April, the hours of opening from Wednesday to Saturday being 11 a.m. It will remain open each night until 10 p.m., and the price of admission is 1/3, children under 12 years of age 6d. Refreshments will be available.

Gibbons' Simplified Stamp Catalogue

The extraordinary popularity of the stamp collecting hobby is displayed in striking manner by the appearance of the fourth edition of *Stanley Gibbons' Simplified Stamp Catalogue*. The third edition was published as recently as the end of October last, when supplies that were thought sufficient to last a year were printed. Actually the edition sold out within four months, and a new one has had to be prepared at short notice in order to meet a continuing demand.

The opportunity has been taken to include all recent issues of stamps of the British Empire and foreign countries. These additions have involved listing 500 new stamps and including 100 additional illustrations, and the catalogue now gives details of over 54,500 stamps, and contains 6,900 full-sized reproductions of them. Among the novelties now listed for the first time are the Queen Astrid mourning stamps, the new series from the Malayan Postal Union, and the fine Nigerian pictorials, in addition to the latest prices for the Jubilee issues.

The evidence given in the new edition of the amazing popularity of the Silver Jubilee stamps is perhaps its most striking feature. Many notable rises in price are shown. For example, the South West African set, quoted in the third edition at 4/–, is now priced at 25/–, and it may be added that since the catalogue went to press the price of this set has jumped to 40/–!

The catalogue is an ideal one for young collectors, and the information in it is more than four months in advance of that in any other catalogue. Copies can be obtained from any stamp dealer, price 5/–, or direct from Stanley Gibbons Ltd., 391, Strand, London, W.C.2, 5/6 post paid in the United Kingdom, 6/2 abroad.

Tents for Campers

Camping enthusiasts know that whatever part of their equipment may be the subject of economy, the tent itself must be sound. Readers who contemplate renewing this essential item, or buying a new tent in order to enjoy a camping holiday for the first time, will be interested in the new season's catalogue just issued by Nuttall and Company, Goodmayes, Ilford. This company specialise in tents fitted with wire cable edges and ridges, and it is claimed that these fittings ensure firm anchorage and a square "set" throughout the life of the tent.

An effective proof of the sturdiness of Nuttall and Company's tents products was given last September, when one of them erected in a field at Barkingside withstood the full force of a 90 m.p.h. gale without suffering the slightest damage.

A copy of the catalogue will be sent, free of charge, to any reader who applies to Nuttall and Company, Goodmayes, Ilford, and mentions the "*M.M.*"

Free Stamp List for "*M.M.*" Readers

The 1936 price list newly issued by our advertiser, Mr. Michael Herbert, is full of interest for stamp collecting readers. It gives details of a wide range of sets and packets, including many subject packets that provide good starting points for building up specialist subject collections such as we have recommended in our stamp pages recently.

Mr. Herbert, whose address is 8, Woodstock Road, Walthamstow, London, E.17, will be glad to send a copy of the list, post free, to any "*M.M.*" reader who applies for one.

Bargain. Breaking Coll. into Appros. Write for selections.—Guest, 11, Vincent Ave., Chorlton, Manchester.

JOIN THE "INVESTORS' STAMP CLUB"

Shares 6d. per month, plus 1½d. postage.

Show this to Dad. Jubilee Year was a good one for Investors. Every Shareholder receives 6d. worth stamps each month, principally new issues. April packet, for example, includes **SIX USED JUBILEES, NEW NIGERIA and DESPATCH RIDER.** You will never get the same stamp twice. Money returned if not satisfied with value.

Dividend (minimum 4 per cent.) declared twice yearly and paid in cash or stamps.

Shares may be fully paid-up in advance—5/– per annum. **FIRST TWELVE** paid-up shareholders will be appointed **DIRECTORS** with valuable privileges.

Apply for full particulars to:

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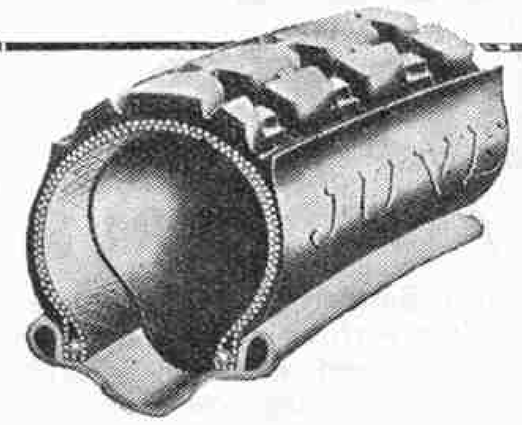
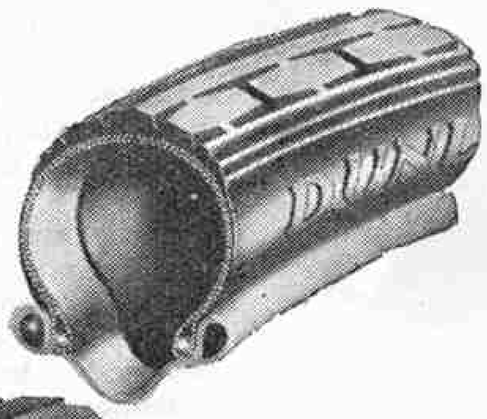
Treat your bike . . . . as by-and-by you'll treat your car



DUNLOP JUVENILE COVER **4/6** TUBE **2/-**



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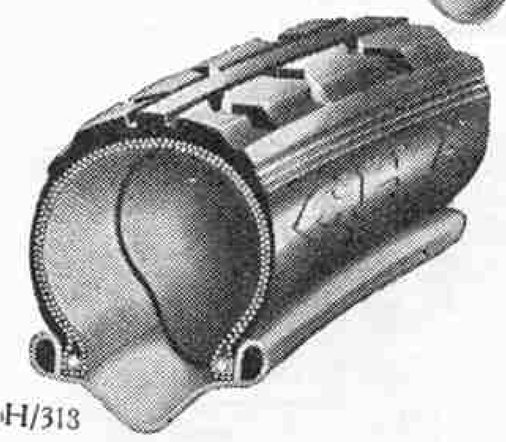

DUNLOP CHAMPION JUVENILE COVER **3/-** TUBE **1/6**

6H/313

SEE that it runs on DUNLOP Tyres. The same factory that makes "the World's Master Tyre" makes cycle tyres with the same care and skill for *your* bicycle. Choose from the

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DUNLOP RUBBER CO. LTD., Fort Dunlop, BIRMINGHAM. *Branches throughout the World.*

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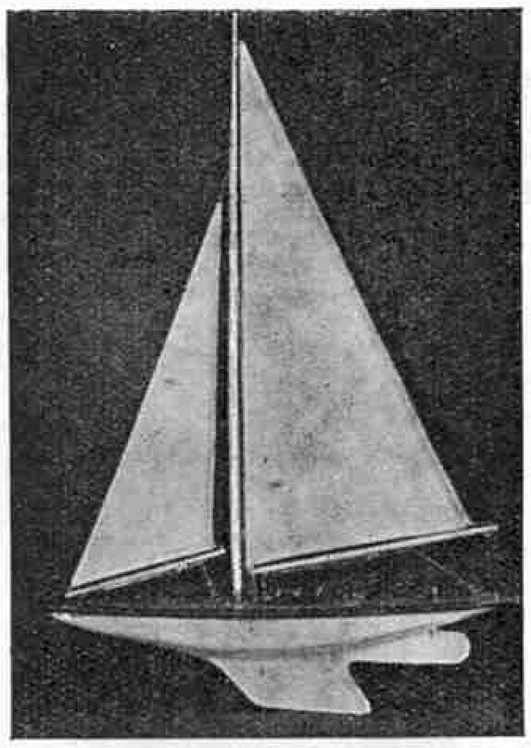


BOND'S

The 'Endeavour' Yachts that sail in any weather

These new Yachts are the latest thing for fast racing work. All of the hulls are hand made in best yellow pine. The two largest Yachts are fitted with Braine type automatic steering. Painted Pale Blue. Cabin Skylight extra.

Prices:

17 in. Yacht with automatic rudder	11/–
21 in. Yacht with automatic rudder	17/6
27 in. Yacht with Braine type steering	37/6
36 in. Yacht with Braine type steering	69/–

Carriage extra.

SAILCLOTH.

This Super Sailcloth is made from the finest **Union Silk** and is very light, extra strong. **2/3** yard, 42 in. wide. Plus Postage.

Send for Bond's 1936 Catalogue, it has 180 pages filled with all types of Locomotives, Boats, Aeroplanes, Tools and Materials. Price **6d.** post free.

BOND'S O'EUSTON ROAD LTD.,
254, EUSTON ROAD, LONDON, N.W.I.

'Phone: Museum 7137. Est. 1887.

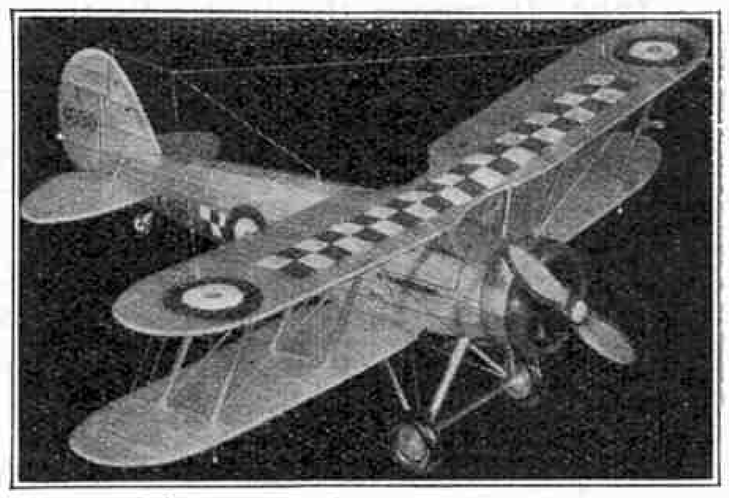
French Agents: Messrs. J. Fournereau, 60, Rue Alphonse-Pallu, Le Vesinet (S-&-O.)

S. Africa Agents: Messrs. J. Alcock & Co., 69, Mooi Street, Johannesburg.

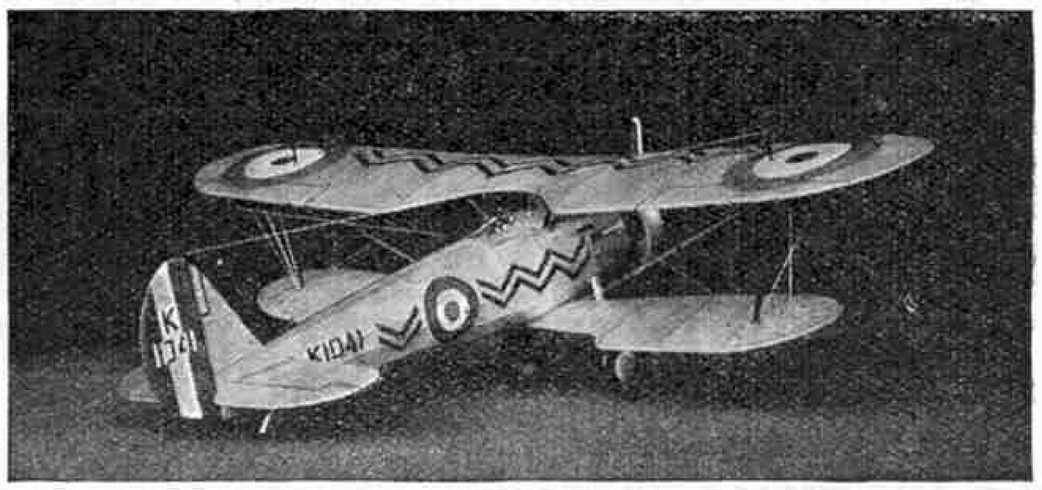
NEW KITS—Flying Scale Models

GLOSTER GAUNTLET 6/6

Carriage paid.
Wing span 21 in.
Length 16¼ in.



We do not expect ever to produce a better kit for the money. The plan is detailed to the smallest accessory. Features Comet's new wing base former for easy building, with Auto-line-up fuselage. All interior cockpit fittings. Kit of parts is complete to the smallest item; printed balsa, spars, flying prop, scale prop, wheels, insignia, TWO tubes cement, etc., etc. OUTSTANDING VALUE, carriage paid for 6/6 (Abroad 2/– extra).



BRISTOL BULLDOG **Wing span 18 in.** **3/6**

Wonderfully detailed plan, exactly to scale. Features Comet's new wing base former, and Auto-line-up fuselage. Builds a sturdy model and is a good flyer. Kit is complete and includes all parts needed. TWO tubes of cement, silver tissue, printed insignia, balsa, flying prop, etc., etc. Complete kit, carriage paid for 3/6 (Abroad 2/– extra).

Send your Postal Order NOW

M. E. SWEETEN LTD., 38, Bank Hey Street, BLACKPOOL

but remember...

Seccotine doesn't mean any adhesive sold in a tube. It means the best adhesive. If your Granddad was a handyman like you, he used Seccotine, for it was the best fifty years ago. And now laboratory tests prove it is still twice as strong as any other adhesive.

For all your models and mending jobs Seccotine sticks with double strength. That's why the Navy and Air Force choose Seccotine—you can be sure they know. So be certain you get real Seccotine. See the name on the tube when you buy it.

Obtainable in tubes, **4½**d., **6**d. and **9**d., from all good Stationers, Ironmongers and General Stores.

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STICKS EVERYTHING

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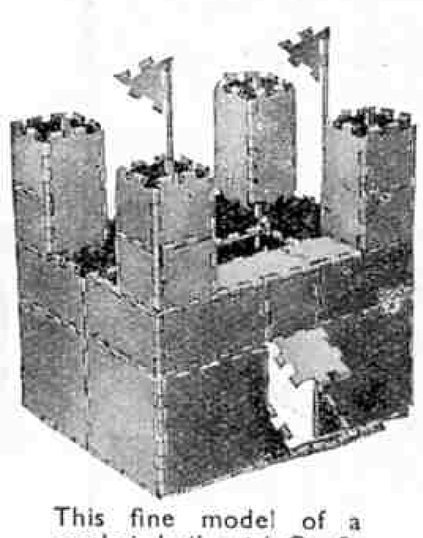
I should like to have, post free, a copy of your Free Booklet.

PRODUCT of MECCANO LIMITED LIVERPOOL

DINKY BUILDER

FOR BOYS AND GIRLS



This fine model of a castle is built with Outfit No. 2, plus two Dinky Builder "A" Packets.

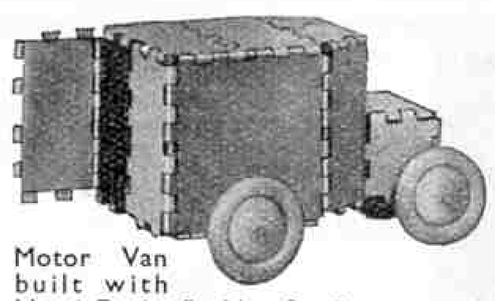
Dinky Builder Outfits are great favourites with boys and girls. The parts contained in them provide a most fascinating constructional hobby, specially designed for the younger children. These brightly coloured parts are fitted together in a most simple and ingenious manner without the use of any nuts and bolts.

There are three Outfits in the series. No. O Outfit is available in bright red and green finish, while No. 1 and No. 2 Outfits can be obtained in bright red and green or in salmon pink and jade green finish.

No. O
DINKY BUILDER OUTFIT

This is an excellent Outfit, containing a good assortment of Dinky Builder parts (including two road wheels), with which a splendid range of models can be built. The Instruction Folder included gives examples of 40 models, but many others of an original character may be constructed by the inventive boy or girl. Price 2/6

No O Dinky Builder Outfit.



Motor Van built with No. 1 Dinky Builder Outfit.

No. 1 DINKY BUILDER OUTFIT

This fine Outfit contains a varied selection of parts, including a set of four road wheels for constructing miniature wheel toys, many examples of which are illustrated in the Instruction Folder. These instructions show a total of 70 fine models that any boy or girl can build. Price 4/11

No. 1 Dinky Builder Outfit.

No. 2
DINKY BUILDER OUTFIT

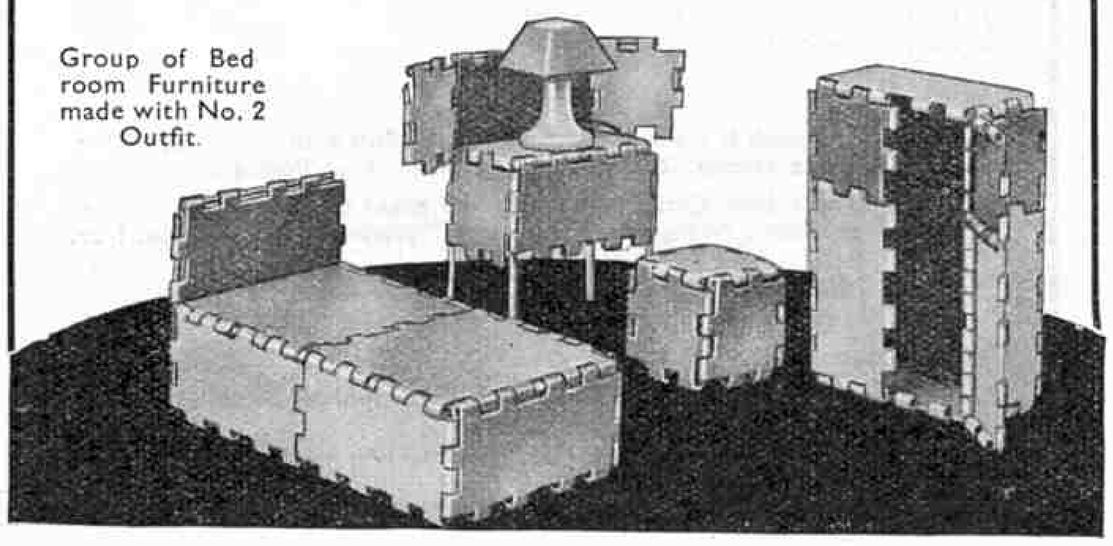
This Outfit contains a comprehensive selection of parts with which all the No. O and No. 1 Outfits models can be built. In addition, the parts in this fine Outfit make possible the construction of seven groups of miniature model furniture. Full instructions are given in the Instruction Folders included in the Outfit. Price 7/11

DINKY BUILDER "A"

The Dinky Builder "A" packet contains a useful assortment of Dinky Builder Parts with which Outfits No. O, No. 1 and No. 2 can be supplemented. Price 1/–

Manufactured by

MECCANO LIMITED, LIVERPOOL 13



Group of Bed room Furniture made with No. 2 Outfit.

SPRINGTIME is BUILDING TIME

ENSURE A SUCCESSFUL FLYING SEASON by Building your Model Aircraft from Expertly designed "MODEL SHOP" Kits.

ALL BRITISH—Designed for British conditions. All our Models have guaranteed performances and will give hundreds of fine Flights. It will pay you to send 2d. in stamps for our fully illustrated Catalogue of Duration and Flying Scale Models. Dozens of designs from which to choose.

Obtainable from High-class Shops and Stores, or direct from:

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Look out for our Advertisement next month announcing an unique Model!

NEW MECCANO PARTS FOR OLD!

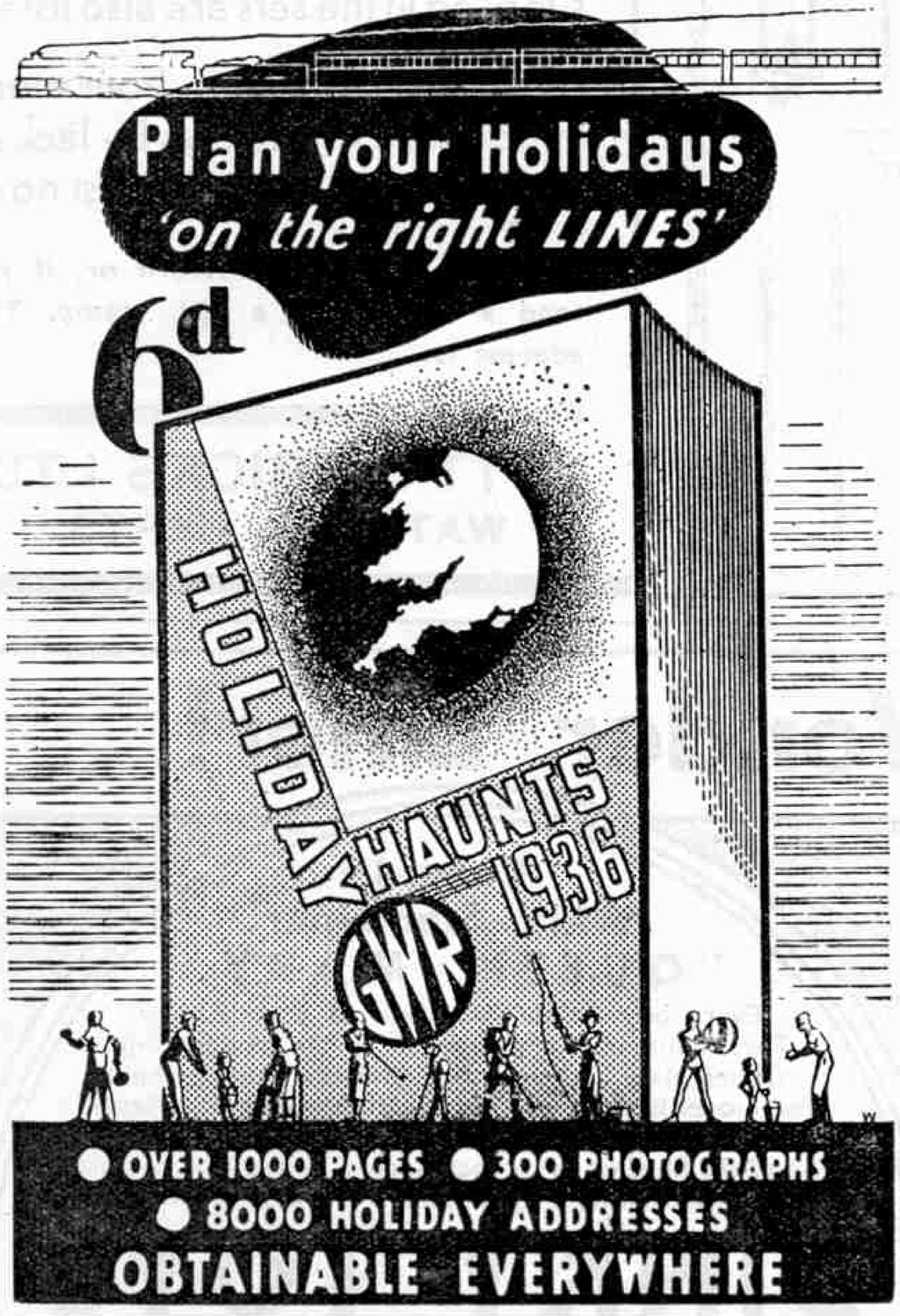
Good News for Meccano Boys

Every Meccano boy should know o the wonderful Meccano Part Exchange Scheme, in order to take the fullest advantage o. it.

We undertake to exchange any damaged Meccano parts for similar new parts at hal the current list price, no matter how old or how much damaged the parts are. Just send them to us, addressed to the Service Department, Meccano Limited, Binns Road, Liverpoo 13, together with a remittance covering hal the cost of the new parts. The remittance should include postage on the new parts and will be exactly the same as that you pay on the parcel of old parts you send us.

It is very important that you enclose your own name and address written in plain characters.

If you prefer to do so, you can effect the exchange through your dealer.



A B.S.A. Air Rifle..

a handful of Pellets

and what excellent sport you can have

Shooting with a B.S.A. Air Rifle must not be confused with shooting with the usual toy air guns.

B.S.A. Air Rifles are so remarkably accurate that many champion marksmen use them for home practice to maintain match-winning form.

To become a really first-class shot, you should follow the lead of the champions and use a B.S.A. Air Rifle. Besides helping you to shoot well, the practice will develop keen eyesight, strong nerves and self-reliance.

Your local dealer stocks B.S.A. Air Rifles and will be pleased to let you handle them. Take Father along with you. No license is necessary to use a B.S.A. Air Rifle in the house, but the purchase must be made by someone over 17 years of age.

B.S.A. Pellets, .177" size, cost only 2/3 per 1,000.

Prices from **45/-** or only **4/3** a month

B.S.A. "Breakdown" Air Rifle .177" bore

POST THIS COUPON TO-DAY

B.S.A. Guns Ltd., 92, Armoury Road, Birmingham, 11.
Send me the B.S.A. Air Rifle Leaflet.

Name.....

Address.....

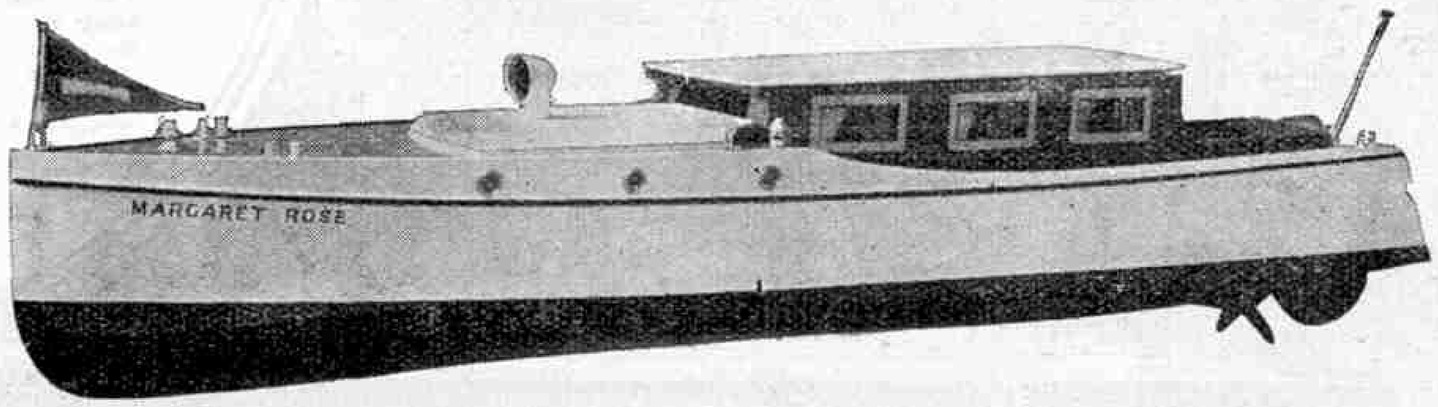
STRAIGHT FROM NORTHAMPTON'S MODEL SHIP-YARD

COMES

'MARGARET ROSE'

gleaming in white and green enamel, the sunlight glinting on her smart fittings. As you can see, this swift Cabin Cruiser has smart up-to-date lines, and her mechanism is of the finest quality. Fitted with either clockwork or electric motor she is priced at **£3/17/6,** an ideal Easter gift for any lucky lad!

"MARGARET ROSE" is just one of the splendid models contained in **New S.17,** BASSETT-LOWKE'S latest Ship. Catalogue. Get it and see for yourself! **New S.17,** 6d. post free. For Model Railways get **A.17,** 6d. For Model Engines get **B.17,** 6d.



See our exhibit at the Model Railway Club Exhibition, Central Hall, Westminster, Easter Tuesday to Saturday.

BASSETT-LOWKE LTD., NORTHAMPTON

London: 112, High Holborn, W.C.1 Manchester: 28, Corporation Street

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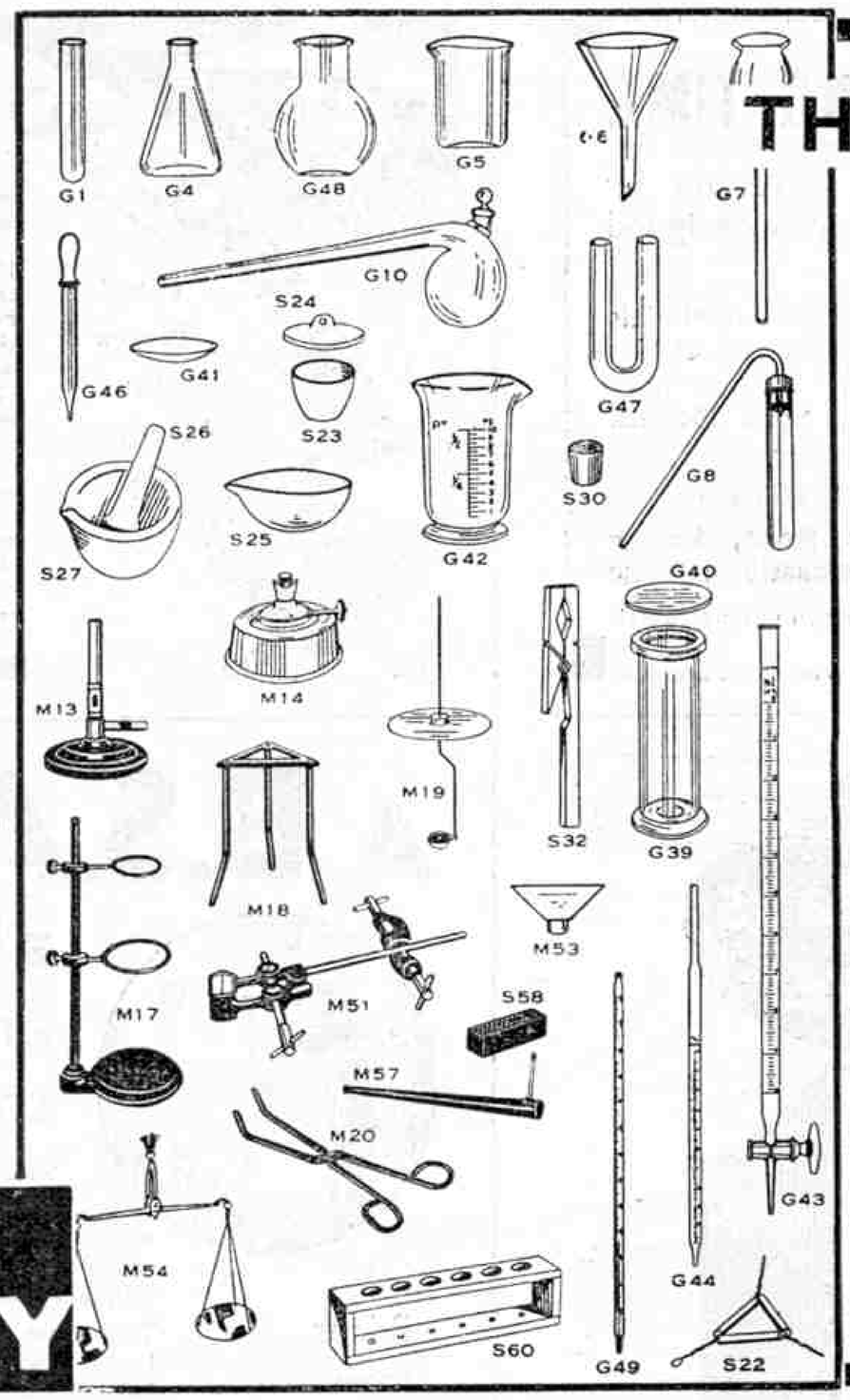
from your

LOTT'S CHEMISTRY



THIS is a page from LOTT'S CHEMISTRY SPARES PRICE LIST, which every Lott's Chemistry enthusiast ought to have by him. It shows all the extra apparatus that you can buy, piece by piece, to make your 'home laboratory' more interesting and complete. They are obtainable at all shops stocking Lott's Chemistry Sets. Extra supplies of chemicals as supplied in the sets are also listed.

Don't be hindered in your more important experiments by lack of apparatus—write for this list now.

Write on a penny postcard or, if you send a letter, use a 1½d. stamp. The address is:

Dept. M.M.,

LOTT'S BRICKS LTD.
WATFORD, HERTS.

The World's Wonder Liner!

Cunard White Star Liner "QUEEN MARY"

Every boy should have one of these Dinky Toys miniatures as a souvenir of the wonder ship "Queen Mary," the most magnificent liner yet built. The model is a perfect reproduction of the giant vessel on a scale of 1 inch to 150 feet. It is full of detail and beautifully finished in correct Cunard White Star colours.

Get this fine Dinky Toys Model from your dealer now!

DINKY TOYS

No. 52A
Cunard White Star Liner "Queen Mary"

The illustration below reproduces the exact size of the Dinky Toys model of the "Queen Mary."

Price 1/-

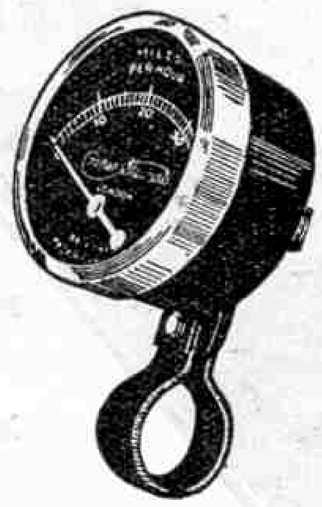
PRODUCT of MECCANO LIMITED LIVERPOOL

See this Wonderful Model at your Dealers!

Manufactured by MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

"I'm having one this EASTER"

Double the interest and pleasure of cycling by fitting this Speedometer. Shows how FAR and how FAST you go. Not a toy, but a real instrument of precision made by the famous Cooper-Stewart Speedometer firm. It is fixed on your handle-bar and driven from the front wheel by means of a flexible shaft. Fitted easily and quickly. Full instructions included. Read all about it in illustrated Descriptive Folder. Post free.



12′6
19′6

Model C.1. Shows how fast you ride ... ...

Model C.5. Records both speed and distance ... ...

Cooper Stewart BICYCLE SPEEDOMETER

When ordering specify 26″ or 28″ wheel and for C.5 for right- or left-hand fitting.

Ask your Cycle dealer to fit one on your Bicycle NOW or send his name and 12/6, or 19/6, according to model required, and we will see you get one by return.

COOPER-STEWART ENGINEERING CO. LTD.

SPEEDOMETER EXPERTS FOR OVER 25 YEARS

(Dept. 4), 136/7, Long Acre, London, W.C.2.

Join the Raleigh Boys

THEY CAN FREE-WHEEL FURTHER ! !

Tom, Dick and Sam, who live not so far away, have all got Raleigh Bicycles. And they do make rings around the other boys! Why, only the other day everyone was playing at who could free-wheel furthest and the Raleigh boys won by yards. The Raleigh is the easiest, smoothest running bicycle made. That's why you'll be so proud of your Raleigh—and why other boys will be so envious. You can get a Raleigh for 5/- down and 2/- a week. Tell your father about it. He'd be glad to pay this small amount for the bicycle that's guaranteed for ever.

From **£4 . 7 . 6** *Cash (Sturmey-Archer 3-speed gear 20/- extra, cash). Deferred Terms* **5/-** *down and 12 equal monthly payments (from* **8/4***). Sturmey-Archer 3-speed gear 2/- extra, monthly. Dunlop tyres, Brooks' saddle and the best of everything.* Send for free copy of "The Book of the Raleigh," and name and address of nearest dealer.

RALEIGH
THE ALL-STEEL BICYCLE

THE RALEIGH CYCLE CO. LTD., NOTTINGHAM.
(Depots and Agents Everywhere.)

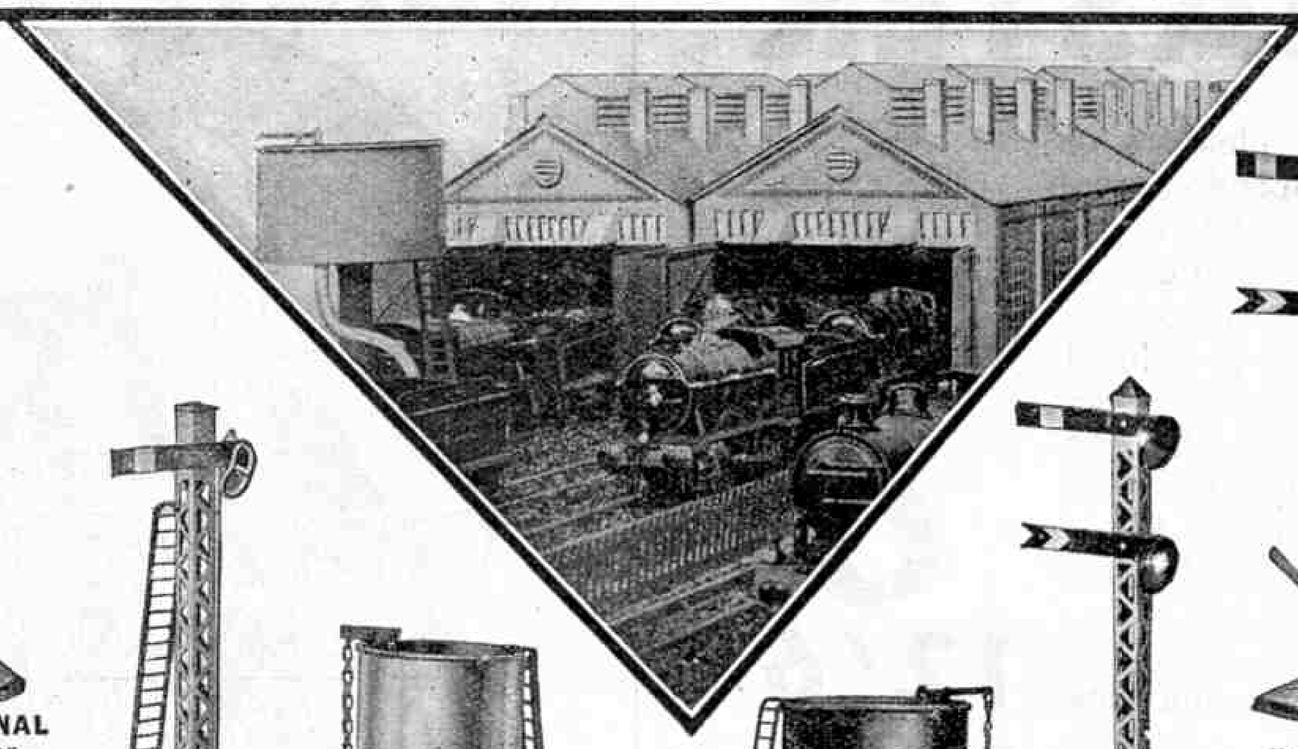
Fit the Sturmey-Archer 3-speed gear—the gear that "makes cycling easy"

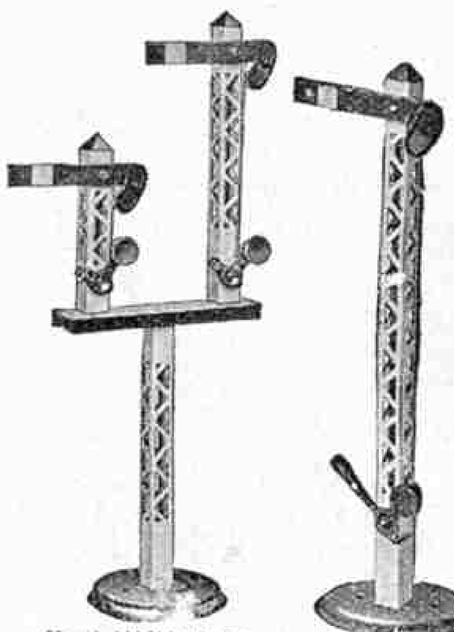
Hornby Series

HORNBY ACCESSORIES

Gauge O

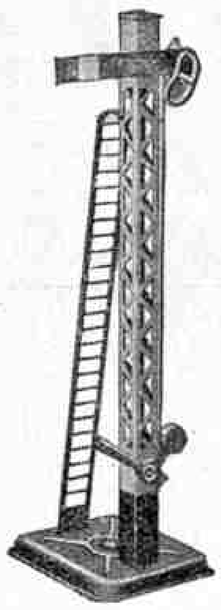
There is a splendid range of Railway Accessories in the Hornby Series, built in perfect proportion and beautifully finished. With these realistic accessories the most elaborate model railway may be constructed and operated in exactly the same manner as a real railway. A selection of Hornby Accessories is shown on this page. Ask your dealer to show you the full range.





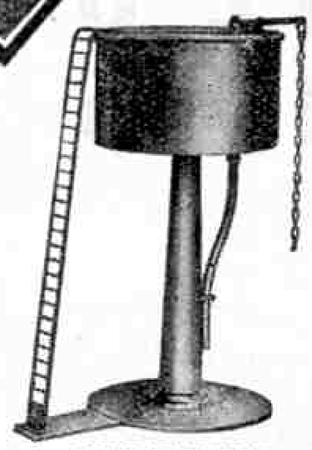
No. 1 JUNCTION SIGNAL
"Home" or "Distant."
Price 2/9

No. 1 SIGNAL
"Home" or "Distant."
Price 1/-

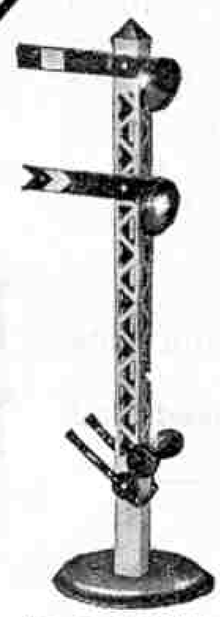


No. 2 SIGNAL
"Home" or "Distant."
Price 2/-

No.1 WATER TANK
Height 7 in.
Fitted with flexible tube and valve lever.
Price 3/-



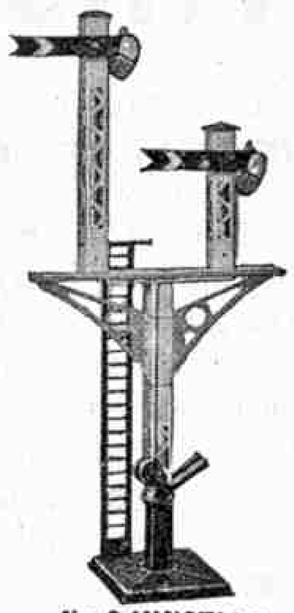
No.2 WATER TANK
Height 9 in.
Fitted with flexible tube and valve lever.
Price 5/9



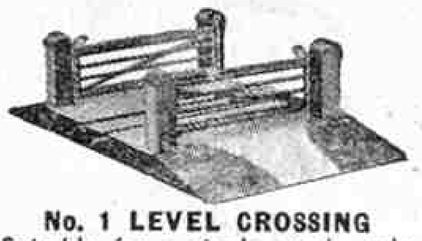
No. 1 SIGNAL, DOUBLE ARM
"Home" and "Distant."
Price 1/6

MECCANO LUBRICATING OIL
Price per bottle 6d.

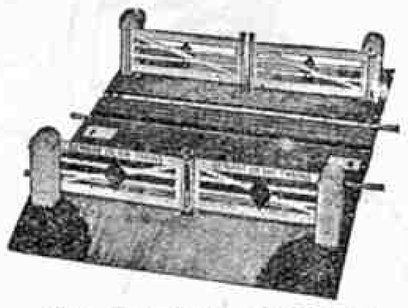
No. 2 SIGNAL, DOUBLE ARM
"Home" and "Distant."
Price 2/6



No. 2 JUNCTION SIGNAL
"Home" or "Distant." Signal arms operated by levers at base. A very realistic model. Price 4/9

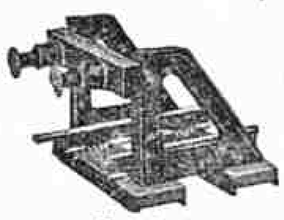


No. 1 LEVEL CROSSING
Suitable for a single track only and has gauge O rails in position.
Price 2/11

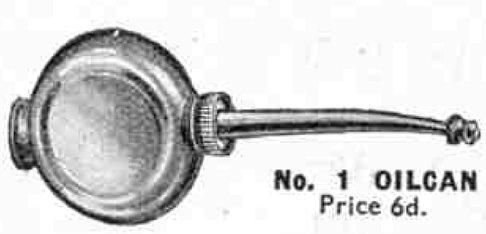


No. 2 LEVEL CROSSING
Measures 13½ x 10½ in., with two tracks of gauge O rails in position
Price 5/6

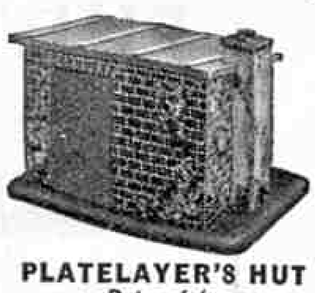
No. E2 LEVEL CROSSING (Electrical)
Similar to Level Crossing No. 2 excepting that a third rail is fitted in each of the two tracks
Price 7/6



No. 1 BUFFER STOPS
(Spring type)
Price 1/-



No. 1 OILCAN
Price 6d.

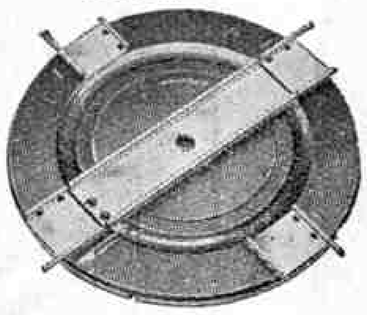


PLATELAYER'S HUT
Price 1/-

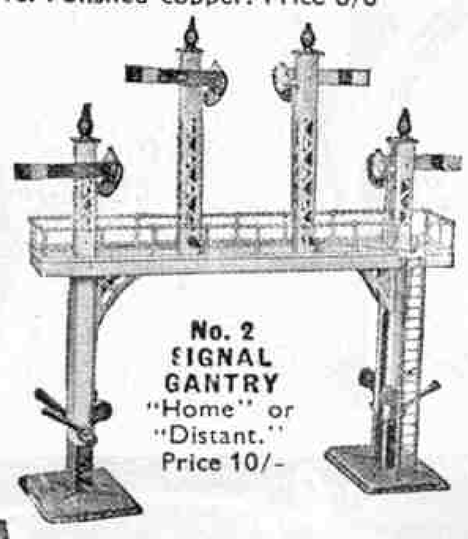
No. 2 OILCAN
("K" Type). The oil is ejected drop by drop by depressing the valve. Polished copper. Price 3/6

No. 1 SIGNAL CABIN
Finished in colours.
Price 2/6

No. 1 SIGNAL GANTRY
"Home" or "Distant."
Price 4/11

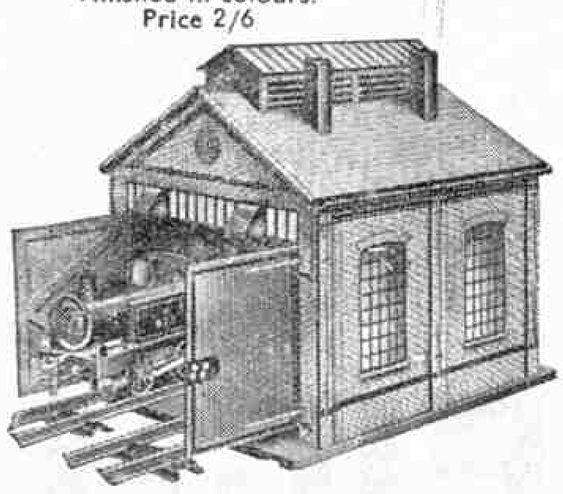


No. 1 TURNTABLE
Price 2/6



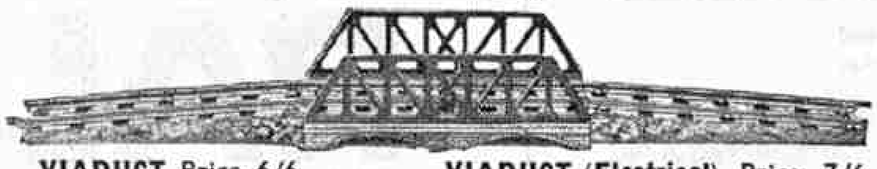
No. 2 SIGNAL GANTRY
"Home" or "Distant."
Price 10/-

No. 2 SIGNAL CABIN
Dimensions: Height 6½ in. width 3½ in., length 6½ in Roof and back open to allow Lever Frame to be fitted inside cabin if desired
Price 3/9

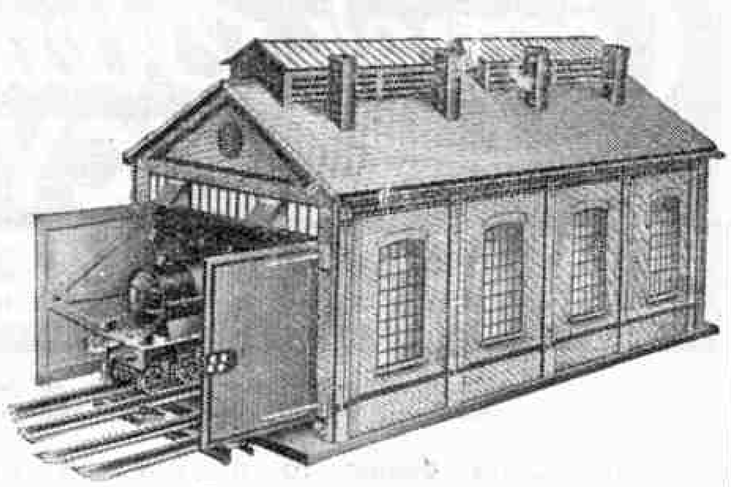


No. 1 ENGINE SHED
This Shed will accommodate any Locomotive and Tender with an overall length not exceeding 8¾ in.
Price 15/-

No. 1 STATION
Length 16¾ in., width 6 in., height 6 in. Price 4/6



VIADUCT Price 6/6
VIADUCT Centre Section only ... ... Price 4/-
VIADUCT (Electrical) Price 7/6
VIADUCT (Electrical) Centre Section only ... ... Price 4/6



No. 2 ENGINE SHED
This Shed will accommodate any Locomotive and Tender with an overall length not exceeding 17½ in.
Price 22/6

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(Neg. by Chas. E. Brown.)

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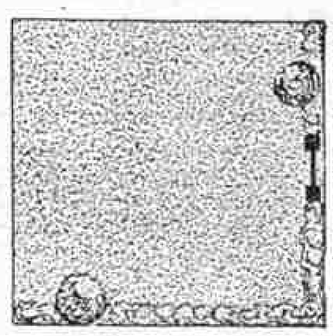


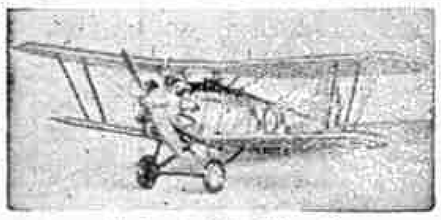
We have for disposal a limited quantity of Countryside Sections, which are no longer included in our range of Hornby Accessories.

Model railway enthusiasts should take this opportunity of enhancing the realism of their layouts by the addition of a selection of these interesting line-side features. They are obtainable at the following prices:

Fields F. Box of four	5/6
Fields G1 and G2. Box of eight (four G1 and four G2)	6/-
Fields J1 and J2. Box of four (two J1 and two J2)	6/6
Fields J3. Box of two	1/3
Fields K1 and K2. Box of four (two K1 and two K2)	4/6
Fields L1 and L2. Box of four (two L1 and two L2)	3/11
Fields M1 and M2. Box of four (two M1 and two M2)	2/11

MECCANO LTD. BINNS ROAD, LIVERPOOL 13

AEROMODELS



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Meccano parts, many of which are here illustrated, combine to form a complete miniature engineering system with which practically any movement known in mechanics can be correctly reproduced. New parts are always being introduced in order to keep Meccano model-building in line with the most modern engineering requirements. The greatest care is taken in the designing of these parts to ensure that they function exactly as their counterparts in actual engineering practice. Ask your dealer for the latest complete illustrated price list.

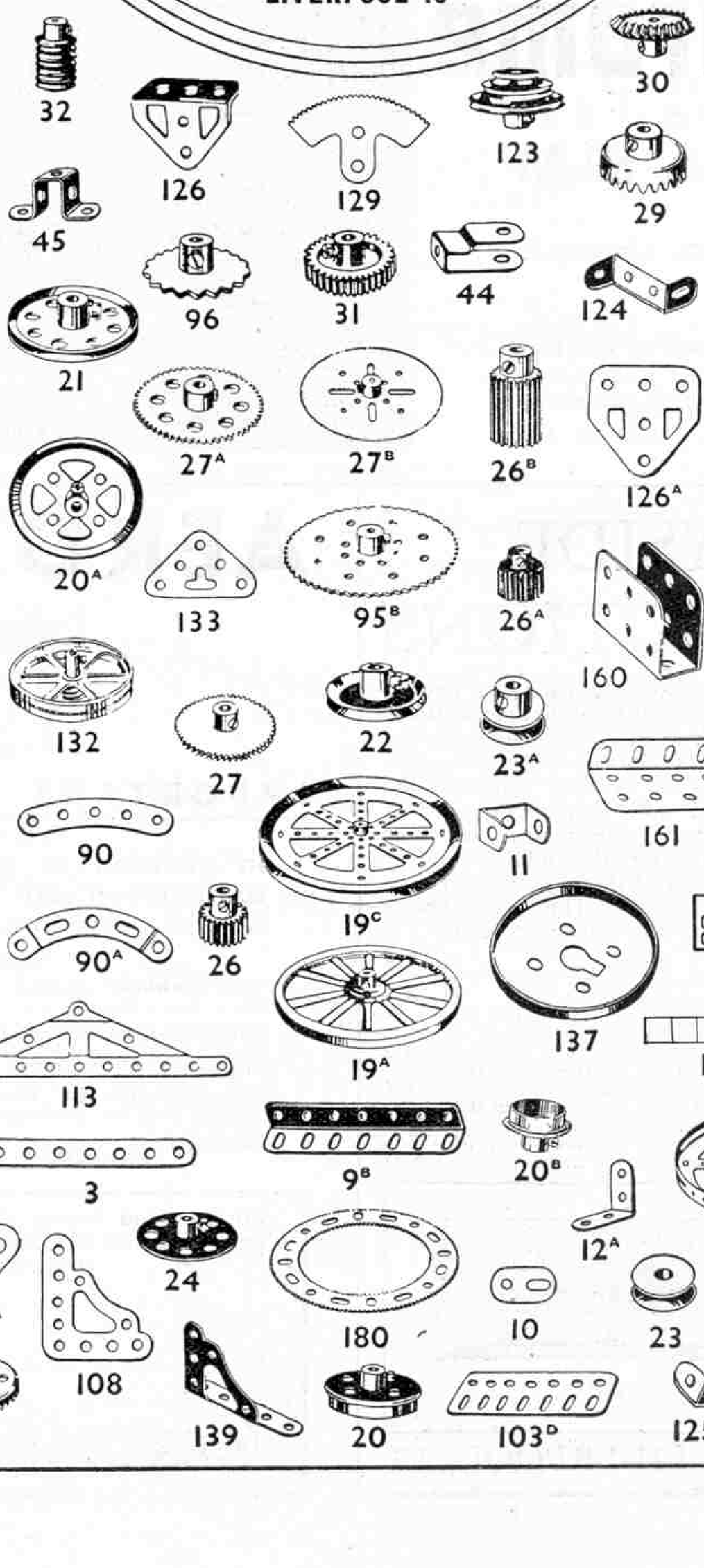
MECCANO LTD., Binns Road
LIVERPOOL 13

PRICES OF PARTS ILLUSTRATED

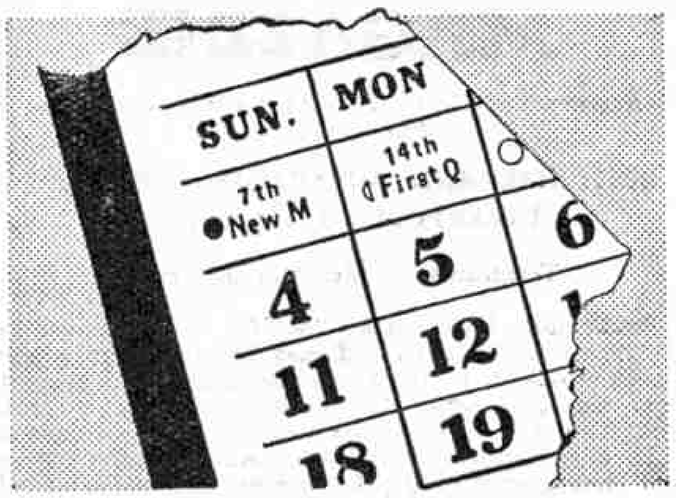
No.			s.	d.
3.	Perforated Strips, 3½"	½ doz.	0	4
9b.	Angle Girders, 3½"	,,	0	8
10.	Flat Brackets	doz.	0	1
11.	Double Brackets	,,	0	3
12a.	Angle Brackets, 1" x 1"	,,	0	6
19a.	Wheels, 3" diam., with set screws	each	0	6
20.	Flanged Wheels, 1⅛" diam.	,,	0	5
20b.	,, ,, ¾" ,,	,,	0	3
	Pulley Wheels			
19c.	6" dia. with centre boss and Set Screw	each	1	9
20a.	2" ,, ,, ,,	,,	0	4
21.	1½" ,, ,, ,,	,,	0	4
22.	1" ,, ,, ,,	,,	0	3
23a.	½" dia. with centre boss and Grub Screw	,,	0	3
22a.	1" dia. without centre boss and Grub Screw	,,	0	2
23.	½" ,, ,, ,,	,,	0	2
24.	Bush Wheels	,,	0	4
26.	Pinion Wheels, ½" dia., ½" face	,,	0	4
26a.	,, ,, ½" ,, ½"	,,	0	5
26b.	,, ,, ½" ,, ¾"	,,	0	6
	Gear Wheels			
27.	50 teeth to gear with ¾" pinion	each	0	5
27a.	57 ,, ,, ,, 1½" ,,	,,	0	6
28.	Contrate Wheels, 1½" diam.	,,	0	9
29.	,, ,, ¾" ,,	,,	0	6
30.	Bevel Gears, ⅞", 26 teeth	,,	0	7
30a.	,, ,, ½", 16 ,,	,,	0	6
30c.	,, ,, 1½", 48 ,,	,,	1	6
	(30a and 30c can only be used together)			
31.	Gear Wheels, 1", 38 teeth	each	0	10
32.	Worms	,,	0	4
44.	Cranked Bent Strips	,,	0	1
45.	Double ,, ,,	,,	0	1
46.	,, Angle Strips, 2½" x 1"	½ doz.	0	6
55.	Perforated Strips, slotted, 5½" long	doz.	1	6
61.	Windmill Sails	4 for	0	6
77.	Triangular Plates, 1"	each	0	1

PRICES OF PARTS ILLUSTRATED (Cont.)

No.			s.	d.
90.	2½" Curved Strips 2⅜" radius	each	0	1
90a.	2½" Curved Strips, cranked, 1⅜" radius, 4 to circle	,,	0	1
95b.	Sprocket Wheels, 56 teeth, 3" diam.	,,	0	6
96.	Sprocket Wheels, 18 teeth, 1" diam.	,,	0	3
99.	Braced Girders, 12½" long	½ doz.	2	6
102.	Single Bent Strips	each	0	1
103d.	Flat Girders, 3½" long	½ doz.	0	7
108.	Architraves	doz.	1	6
110.	Rack Strips, 3½"	each	0	2
113.	Girder Frames	,,	0	3
118.	Hub Discs, 5½"	,,	1	3
123.	Cone Pulley	,,	1	3
124.	Reversed Angle Brackets, 1"	½ doz.	0	4
125.	,, ,, ,, ½"	,,	0	2
126.	Trunnions	pair	0	3
126a.	Flat Trunnions	each	0	1
129.	Rack Segments, 3" diam.	,,	0	5
132.	Flywheels, 2¾" diam.	,,	2	0
133.	Corner Brackets, 1½"	,,	0	1
133a.	,, ,, 1"	,,	0	1
137.	Wheel Flanges	,,	0	3
139.	Flanged Brackets (right)	,,	0	2
143.	Circular Girders, 5½" diam.	,,	1	0
145.	Circular Strips, 7½" diam. over all	,,	0	9
147.	Pawls, with Pivot Bolt and Nuts	,,	0	3
148.	Ratchet Wheels	,,	0	6
154a.	Corner Angle Brackets, ½", right hand	½ doz.	0	6
154b.	Corner Angle Brackets, ½", left hand	,,	0	6
158a.	Signal Arms, Home	each	0	5
160.	Channel Bearings, 1½"x1"x½"	,,	0	2
161.	Girder Brackets, 2"x1"x½"	2 for	0	3
167.	Geared Roller Bearings	each	20	0
168.	Ball Bearings, 4" diam.	,,	3	0
170.	Eccentrics, ½" throw	,,	0	9
180.	Toothed Gear Ring, 3½" diam. {133 external teeth / 95 internal ,,}	,,	2	0



EVERY DAY



another opportunity

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Agriculture
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Architecture
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Building
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Dairy Farming
Draughtsmanship
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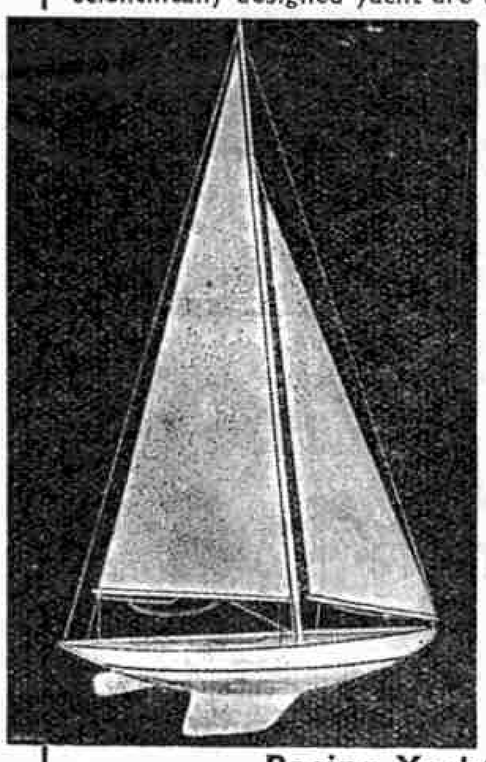

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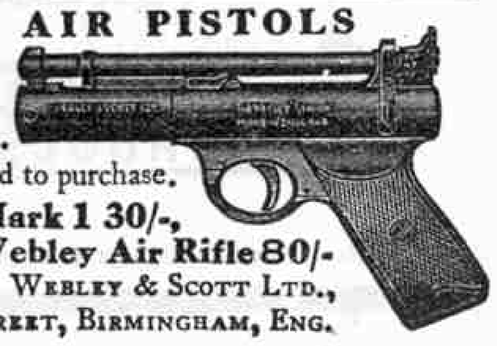

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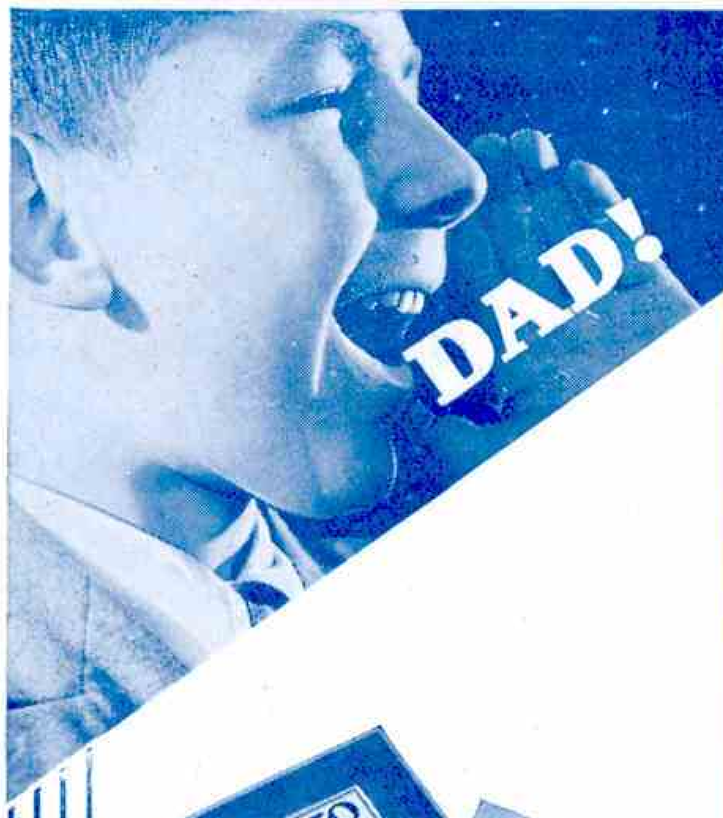

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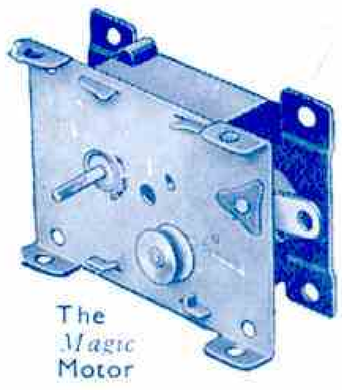

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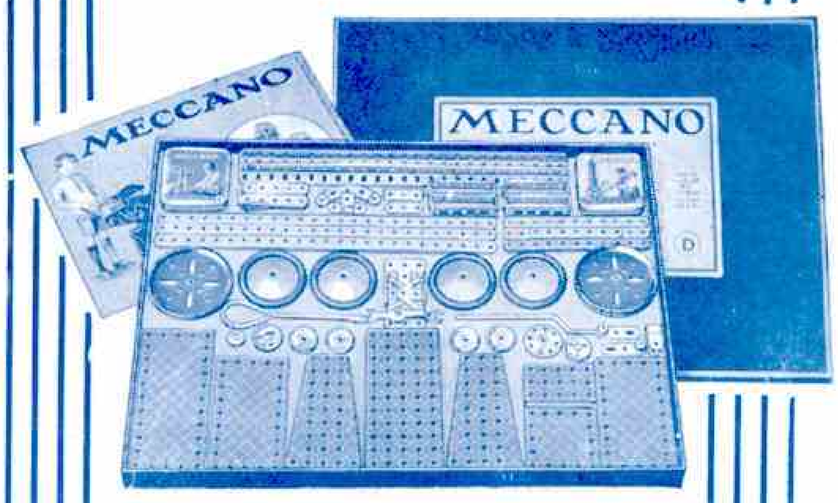

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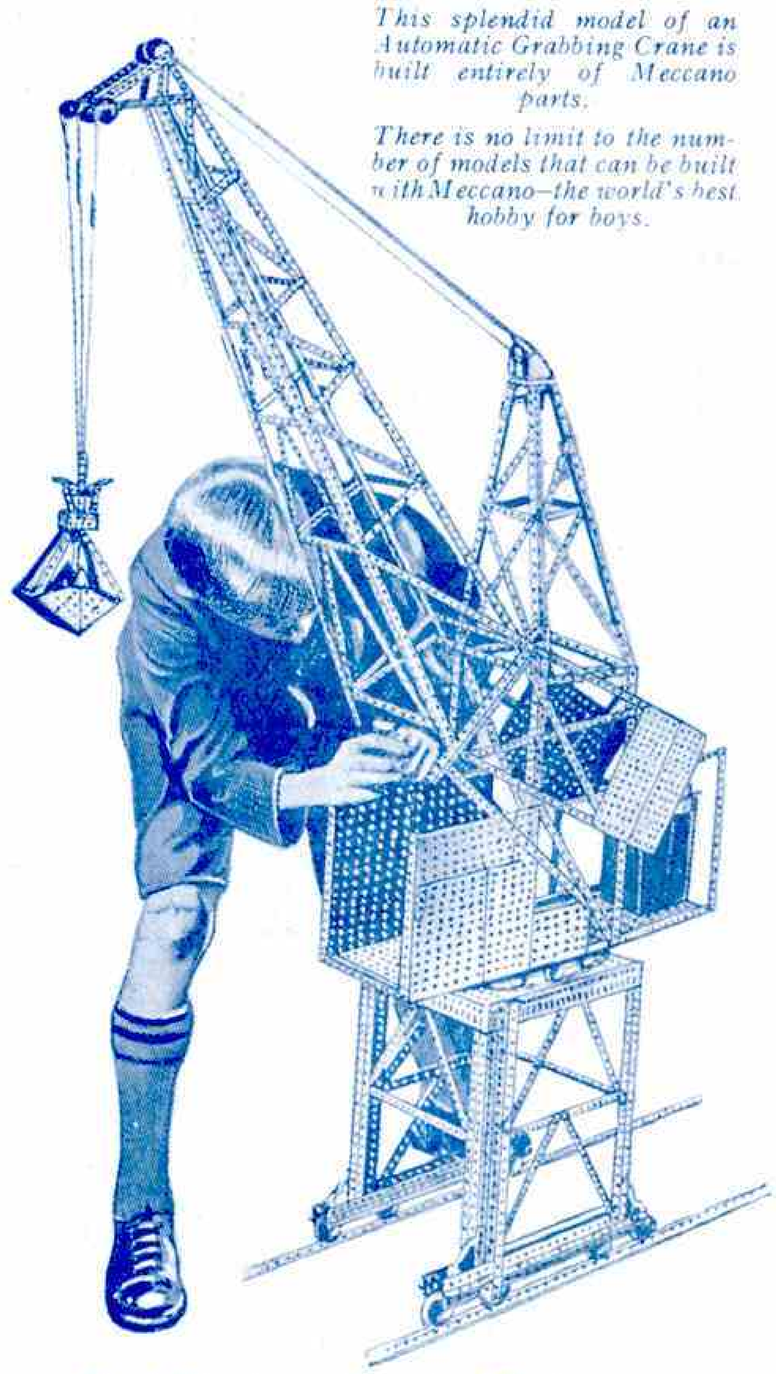

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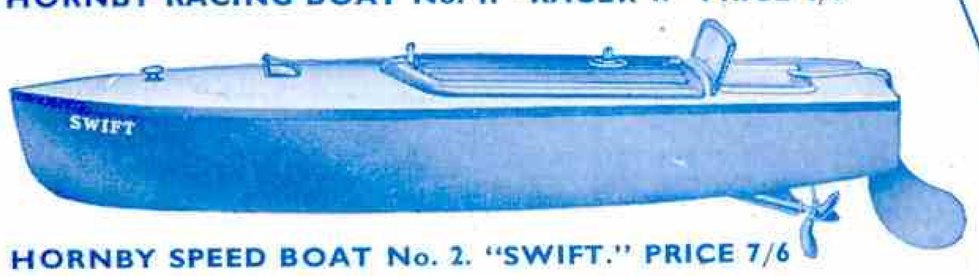

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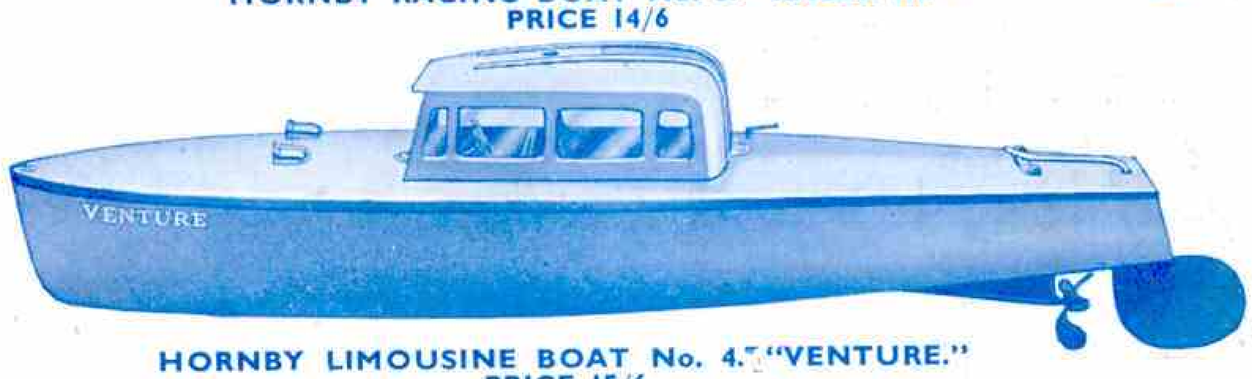

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